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THE

OURNAL OF AGRICULTURE.

JULY 1857—MARCH 1859.

NEW SERIES.

WILLIAM BLACKWOOD AND SONS, EDINBURGH,
AND 37 PATERNOSTER ROW, LONDON
MDCCCLIX.

CONTENTS.

THE

JOURNAL OF AGRICULTURE.

ON THE POSSESSION OF LAND AS AN INDUSTRIAL OCCUPATION FOR THE PEOPLE.

By the Rev. DAVID ESDAILE.

OF all remedies for the poverty and degradation of a rural population the most natural and the most efficacious is to encourage the acquisition of landed property. The desire to possess a portion of the earth which we can call our own is felt universally, and is especially strong in Scotchmen. Sir Walter Scott, himself a striking example of the truth of his own remark, declares that "no sooner does a Scotchman get his head above water, than he makes for the land. A youth and manhood may be spent in the busy haunts of merchandise, but for old age is reserved the dignified leisure of being Laird of Claypots!" Although unable to analyse this feeling of respect for landed property with the eloquence of the philosophic Guizot, all men entertain the sentiment the origin of which he thus explains: "Movable property or capital may procure a man all the advantages of wealth, but property in land gives him much more than this. It gives him a place in the domain of the world; it unites his life to the life which animates all creation. Money is an instrument by which man can procure the satisfaction of his wants and his wishes. Landed property is the establishment of man as sovereign in the midst of nature. It satisfies not only his wants and his desires, but tastes deeply implanted in his nature. And whilst property in land is more consonant than any other to the nature of man, it also affords a field of activity the most favourable to his moral development, the most suited to inspire a just sentiment of his nature and his powers. Men do not analyse these facts, but they have an instinctive sentiment of them, which powerfully contributes to that peculiar respect in which they hold property in land, and to the preponderance which that kind of property enjoys over every other. This preponderance is a natural, legitimate, and salutary fact, which, especially in a great country, society at large has a strong

interest in recognising and respecting." We quote these senti ments of a distinguished politician, and shall illustrate them i reference to our national position, because we live in a state o society the tendency of which is more and more to divert us fron the primitive employment of the human race, and to render mor difficult the general acquisition of that kind of property for whicl we have such instinctive longing and undeniable respect.

From various quarters we hear of the injurious results of limit ing the numbers of those interested in landed property, either a proprietors or tenants. We find gentlemen conversant with rura matters, and having no object to serve, declaring it as thei opinion, that "the large-farm system has been carried to an exces injuriously affecting the whole system of rural economy." Sucl is the language of the Report on Agricultural Labourers by Committee of the Synod of Angus and Mearns. The Rev. H Stuart, author of a well-known pamphlet on agricultural labourer writes thus: "In all transitions men are apt to run to extreme and so has it been in that of farming too; and hence it is that sufficient number of *good* crofts and small farms have not bee reserved in most districts, to which a thrifty labourer could aspir as the tenant, after a reasonable time of service and of saving. Sa pity it is that there are not now many more of them, as a stimulu and a reward, and a resting-place in old age for the saving an deserving labourer."

Mr Stuart's benevolence leads him to sympathise with th labourer. So do we. At this moment we are thinking with re gret of the most respectable, laborious, and saving ploughman i the district where we write, leaving it, and carrying his conside able gains to Canada, because here he cannot procure a sma farm. We look upon the departure of such a man as the loss c so much of the bone and muscle of the body politic. And know ing this to be a case of frequent occurrence, seeing the diminishin supply of rural labour, and believing that landlords, farmers, an labourers are all suffering from such a state of things, we think w do well when directing attention to the consequences, and endea vouring to demonstrate that national prosperity and individua happiness will be promoted by a greater number of the people be ing possessors of land, or interested in it as tenants.

We are not, however, about to advocate the subdivision of a the land possessed in masses by the wealthy, or of all the larg farms occupied by enterprising tenants. We only wish to demon strate that, if it be a pleasure to be the owner or the cultivator o and, this is a happiness intended for many, and which, if enjoye by many, will be for the common weal! We hold that it will b for the public good to show more respect for Solomon's opinion,— "The profit of the earth is for all: the king himself is served b . field."

Men of the most opposite political opinions agree in representing the possession of land as the best counteractive of those influences by which advancing civilisation depresses the mass of the people. "The honest acquisition of a little property," says Lord Brougham, "and its attendant importance, is beyond any other circumstance calculated to reform a needy man, by inspiring him with a respect for himself, and a feeling of a stake in the community, and by putting a harmless and comfortable life at least within the reach of his exertions. If this property is of a nature to require constant industry in order to render it of any value; if it calls forth that sort of industry which repays the labourer, not with wealth and luxury and ease; if, in short, it is *property in land, divided into small portions*, and peopled by a few inhabitants, no combination of circumstances can be figured to contribute more directly to the reformation of the new cultivator's character and manners."*

It is not difficult to understand how this should be. The gratification of a strong natural desire is of itself a source of happiness; and in the cultivation of his little property the small land-holder finds constant occupation, to which he applies himself with an energy for which we shall vainly look in the hired labourer or the temporary tenant. The beneficial effect upon his character admits of an equally obvious explanation. "In almost all the other trades or professions, success," as M. Guizot truly observes, "appears to depend solely on himself,—on his talents, address, prudence, and vigilance. These are as necessary here as elsewhere to the success of his labours; but they are evidently no less insufficient than they are necessary. It is God who rules the seasons and the temperature, the sun and the rain, and all those phenomena which determine the success or the failure of the labours of man on the soil which he cultivates. There is no pride which can resist this dependence, no address which can escape it. Nor is it only a sentiment of humility as to his power over his own destiny which is thus inculcated on man, he learns also tranquillity and patience. He cannot flatter himself that the most ingenious inventions or the most restless activity will ensure his success; when he has done all that depends on him for the cultivation and fertilisation of the soil, the more do we discover how rich it is in salutary lessons to his reason, and in benign influences on his character." Trust in the divine goodness, patient and skilful taking advantage of divine arrangements, being thus natural characteristics of the man deriving his livelihood from the cultivation of the soil, he must evidently be the possessor of virtues rendering him a valuable member of the community. He has little leisure for brooding over theoretical plans for the regeneration of society. He knows that

* *Colonial Policy*, i. p. 62.

industry and prudence will make him comfortable, and is ther fore disinclined to embark his little all on the troubled sea of social revolution. City wits may laugh at him as "a slow coach and he may be unreasonably long in making up his mind wheth something *new* be also something *good*. Still, the foresight, di gence, and economy essential to his comfortable existence, are m beneficial to the common weal. And the exercise of these virtu (which enables him to add to his little possession, or at least hand it down unimpaired to his children) stimulates others to a at the acquisition of like advantages by the display of like pruden and assiduity. He is, therefore, the kind of man whose existen is politically desirable. This more distinctly appears when reflect that the country is the source from which the town dra new supplies of physical no less than of mental energy, and th the loutish ploughman soon becomes the smart soldier, whose sto heart and stalwart arm and vigorous lungs singularly qualify hi to endure the hard labour of a prolonged siege, or to exhil the fierce energy of a brief struggle hand to hand.

The mental and moral characteristics of those occupying sm farms are strikingly displayed in such cases as the two followin recently brought under our notice in a certain district north the Tay:—

No. I. was the tenant of a small farm, occupied by his fami for a couple of centuries! It is barren hill land; yet here reared seven sons and two daughters, who have all turned o well. One son is a clergyman, another is a parochial teacher, a a third succeeded his father in the farm. This worthy man havi no "closet" in which to "pour out his soul in secret," made t stable his oratory; there, on his knees, he was seized with fat paralysis.

No. II. has also been descended from "forbears" occupyin under the same family, a little farm for nearly two centuries. I has six sons,—one a clergyman, the rest thriving farmers, a three daughters married to large farmers. Our venerable frie numbers about a hundred respectable descendants, in the shape children, grandchildren, and great-grandchildren. He is also elder of the Kirk; and to see him presiding at an elder's dinner to our taste something at least as gratifying as to be present at "feast" with "a ruler."

We hold that enlightened national policy demands that care taken that the number of such a class of cultivators of the soil not unreasonably diminished, with a view to the still further dev lopment of the large-farm system.

Nor can it be doubted that the more general diffusion of proper n land ought to be encouraged by those political economists w believe that population necessarily tends to increase faster th [illegible] faster than profitable employment for t

mass of the people. It is notorious that the most needy are the most thoughtless in incurring the responsibilities of the married state, and that they are the least likely to agree with Milton that

> Miserable it is
> To be to others cause of misery,
> Our own begotten, and of our loins to bring
> Into this cursed world a woeful race.

The ragged, half-starved man, dependent on the precarious pittance of daily wages, is disturbed by no such prudent calculations as enter so largely into the cogitations of the rich when meditating on the gain and loss of married life; and therefore he takes the earliest opportunity of gratifying his animal propensities. "A man is poor," said Doctor Johnson; "he thinks, 'I cannot be worse, so I'll e'en take Peggy.'" "Peggy," to carry out the doctor's illustration, is in service, and quite comfortable; but somehow she is always thinking "how nice it would be to be her own mistress, and to *have rest for her bones*," as she phrases it. And so she marries a poor weaver, and *finds rest—to her jaw-bones!* as her no longer plump and rosy cheeks too plainly declare. The possessor of a small holding is over head-and-ears in love with a small farmer's bouncing daughter, who receives with favour the homely expressions of his fervid admiration. But the advent of "the happy day" is postponed by sundry calculations as to the cost of flails and fanners, feather-beds and frying-pans; and the worthy parish-minister is not prematurely called to pronounce the nuptial benediction with an inward groan when remembering his parishioners' forgetfulness of the moral notions current in Lilliput, where, Dean Swift asserts, "it is thought that nothing can be more immoral than for people, in subservience to their own appetites, to bring children into the world and leave the burden of supporting them on the public." When thus describing the patient industry of the man hoping to possess "Peggy," and to be the tenant of "a bonny bit o' land," we open Horace, and are amazed to find that the witty old heathen has given a far better portrait in less than three lines!—

> Qui studet optatam cursu contingere metam,
> Multa tulit fecitque puer, sudavit et alsit;
> *Abstinuit venere* et vino.

In order, then, to check the procreative tendencies of our species in a manner which shall not do violence to our instinctive feelings, we must encourage the mass of the people in their efforts to acquire an interest in land. The passions of men are not to be controlled by the "preventive checks" of political economists, but by the operation of those feelings and desires which accompany the possession or the occupancy of this kind of property. Instead, therefore, of denying the poor what Southey called "the luxury of marriage," and preaching to them the propriety of disobeying the

antediluvian precept, "Be fruitful and multiply," we are wisely employed, and more likely to be listened to, when tc them that, if they would be comfortable when replenishing earth, it must be by possessing and subduing it.

Although we should as soon think of insisting on the prop of circumcision as of minutely imitating Hebrew principl legislation in regard to property in land, we verily believe our national prosperity and happiness would be largely add by at least an approximation to the polity of ancient Is according to which 600,000 proprietors had from sixteen to tw five acres each.* A recent relaxation of the law of ents Scotland has brought into the market such an amount of la property as considerably facilitates the more general acqui of land; and we trust that the greater ease with which it is attainable may have the effect of directing the minds of capit more to this kind of property, and that the increasing numbe the people interested in agriculture may restore the proper pr tion between the manufacturing and the agricultural inte There are grave reasons for believing that our national prosp cannot be securely based when the manufacturing popul greatly exceeds what the land is capable of supporting, an national energies are mainly turned to making "Englan workshop for the world;" as if our mission were to sell cotton a farthing per ell cheaper than it can be sold by any other pe And, therefore, many who have no admiration for either the p or the style of Mr Carlyle hear him gladly when thus discou in his peculiar fashion, on the farthing-per-ell mission o nation: "A most narrow stand for a free nation to base itse —a stand which, with all the corn-law abrogations possible, not think will be capable of enduring." "All this mammon-g of supply and demand, competition, *laissez faire*, and devil tal hindmost, begins to be one of the shabbiest gospels ever pre on earth, or altogether the shabbiest. Were the corn laws to-morrow—there is nothing yet ended, there is only room f manner of things to begin." †

In the same strain we find Sir A. Alison declaring that ' utterly impossible that this unparalleled growth of our manufa ing industry can co-exist with the firm foundation of p prosperity. Its obvious tendency is to create immense weal one part of the population, and increase numbers in anot to coin gold for the master manufacturer, and multiply childr his cotton-mills—to exhibit a flattering increase in the ex and imports of the empire, and an augmentation as appalling paupers, its depravity, and its crimes." For a remedy to evils, present or possible, we look to a combination of agric

* ... *Lectures on the Pentateuch*, ii. 13.   † *Past and Present*, p.

with manufactures, because we shall thus place our national prosperity on a more natural and extensive basis, and shall also call into existence a greater amount of actual and permanent wealth. This is the more necessary now that the corn-law has been repealed; and should the recent enormous expansion of our trade and commerce prove durable, more capital will be invested in manufactures, and each decennial census will, like the last, exhibit a smaller proportion of the people engaged in the pursuits of agriculture; more and more of the national wealth will be employed in a manner comparatively unproductive; multitudes will engage in the eager competition of supplying us with articles the demand for which is naturally limited: they shall *only manufacture*, not *produce*—because their labour, expended on existing materials, communicates to them a new value so long as markets are not glutted. They do not create that which is of substantial and permanent worth, such as corn or animal food, with which the world has not been, and is not likely to be, overstocked. Capital employed in manufactures only furnishes labour for the artisan and a profit to the manufacturer; but when laid out in the cultivation of the soil it not only does the like to the peasant and the proprietor, but also increases the natural productiveness of the earth, and renders it capable ever afterwards of sustaining an additional number of human beings, and of animals valuable to man. Prosperity arising from the pursuit of agriculture is, therefore, not only less fluctuating, but more permanent than that derived from trade; so that, while the commercial greatness of our country may be outstripped by the successful competition of foreign rivals, it will be our own fault if we be impoverished by our having neglected the agricultural resources of the United Kingdom and her magnificent colonial possessions. Bearing in remembrance how imperfectly these are as yet developed, we can satisfactorily answer the query—Where can land be found for the occupation of the poor without dispossessing the rich, or injuriously subdividing all the larger properties in the kingdom? Ireland contains 4,900,000, England 3,454,000, and Scotland 5,950,000 acres capable of improvement.* In these wide domains, extending to no less than 14,304,000 acres, there is an untouched mine of national wealth, from which the labour of the people may extract riches of more value than all Australian or Californian gold.

The lands we have alluded to are entitled, by statistical writers, "capable of improvement;" and to them they add 15,871,463 acres, characterised as "unprofitable." There is, however, abundant reason for believing that many hundred thousands of acres so designated may be brought into profitable cultivation. For instance, Blair-Drummond moss, in Perthshire, seemed doomed to

* PORTER'S *Progress of the Nation*, i. 177.

hopeless sterility. And yet, by the industry of the "moss lairds to whom its amelioration was intrusted, this extensive tract country—so long reckoned worthless—now bears valuable cro and yields an annual rent of from £3 to £5 per acre!

The Highland Society obviously believes that large masses the Scottish soil may be profitably reclaimed. It is yearly off ing premiums for the reclaiming of waste land, and its Transactio are constantly publishing interesting details of the manner in whi the reclamation has been successfully performed.

If an instance be sought for from Ireland, here it is; and pray that it be remembered that it is there a common one. "T miles from the little town of Kilcullen, in Kildare, is a tract of e cessively green land, dotted over with brilliant white cottag each with its couple of trim acres of garden, where you see thi potato ridges covered with blossom, great blue plots of comfortal cabbages, and such pleasant plants of the poor man's garden. T or three years since the land was a marshy common, which h never, since the days of the Deluge, fed any being bigger than snipe." *

In like manner, if we look to England, we are furnished w most remarkable demonstrations of what patient industry c effect in localities apparently ill fitted to yield it an adequate rewa Sir Humphry Davy declared, on analysis, that Bagshot Hea was naturally the most barren soil in England; and now gr portions of it are covered with thriving plantations, interspers with green fields. The poor chalks of Beachy Head, in Sussex, well as deep trembling bogs, such as Chatmoss, in Lancashi have been brought into profitable cultivation by the use of imp ments so little costly as a pick-axe and a spade.

With such facts before us, and without pausing to dilate upon ma similar within the personal knowledge of our readers, we think impossible to avoid the conclusion that immense sections of t British and Irish soil are uncultivated from lack of industry, sk and facility of possession, rather than because smitten by the cu of irremediable sterility. The sea is no doubt

> Creation's common, which no human power
> Can parcel or enclose;

but these millions of acres, situated within easy reach of stalw arms longing for permission to develop their countless wealth, why are they desolate, unparcelled, unenclosed, when their bei eft in a state of nature is such a manifest national disadvantag Why, in order to gratify their natural desire for the possession and, should our rural population have to expatriate themselv d become the citizens of infant empires at the antipodes, or the Atlantic? At a time when the supply of agricultu

* *Irish Sketch-Book.*

labourers is inconveniently diminishing year by year, why decline trying to attach our rural population to their native land, by giving them a greater interest in the soil, in such a manner as varying circumstances may render expedient? We are persuaded that a reasonable proportion of little properties, of small farms, and of good crofts, is essential to a right state of things in this country. If our readers be of the same opinion, but alarmed at the idea of a general subdivision of land throughout the kingdom, we say *suum cuique*—let every man keep his own cultivated land if he choose; but let him think twice before adopting the dog-in-the-manger policy of hindering others engaging in the hard but profitable toil of reclaiming those wastes, which are still as they were in those ancient days when "Noah began to be a husbandman." If that policy be adhered to, we anticipate that a stronger impulse will be given to emigration, which already has been at the rate of a thousand per day! If a man, from the increasing competition for land, or from the diminished number of small farms and pendicles, cannot in this country gratify his desire to lead a rural life, how weakened will be the tie which heretofore has bound him to his native land! How apt his fancy to be captivated by splendid visions of "nugget"-land! How eagerly will he read in the provincial newspaper, that "Her Majesty's Colonial Land and Emigration Commissioners are prepared to grant a limited number of passages to Victoria and New South Wales"! How gratified will he be to learn that these Commissioners require, as "payment towards passages," only £1 from "married agricultural labourers, shepherds, farm-servants, &c., under 45 years of age," and that for this trifling sum they "supply provisions, medical attendance, cooking utensils, new mattresses, bolsters, blankets, and counterpanes, canvass bags to contain linen, &c., knives and forks, spoons, metal plates, and drinking mugs, which articles will be given, after arrival in the colony, to the emigrants who have behaved well on the voyage"! How pleased will be the father of a "sma'" family, that "no payments are required for wives, or for children under 14 years of age accompanying their parents." How manifold, too, the temptations to emigrate to Canada (within thirteen days' sail of this country), where grants of land are offered for nothing, or on easy terms; where there are thousands of fellow-countrymen, religious ordinances as in "the old country," and means of education so cheaply provided, that to avail itself of these alone might induce many a struggling family to sail for Canada.

The report of the Census Commissioners demonstrates that the numbers of our people employed in agriculture are rapidly diminishing. We have shown how strong is the desire to be connected with property in land, and have pointed out how it may be gratified without violence to subsisting arrangements. And now, we ask,

have such facts been duly attended to? We crave for them more attention; we are confident that the public interest demands it.

The remarkable man who at present guides the destinies of France is alive to the importance of bringing under cultivation the largest possible area of land. In the *Daily News* of 18th March we read: "The Emperor, wishing to follow up by example the precepts contained in his last speech *with regard to the cultivation of waste lands*, has given orders to purchase for his account a large quantity of virgin soil in the Landes, with the view of clearing it, and making it a model farm. A number of women, belonging to the department of the Gironde, have arrived at Bayonne, to be employed in bringing into cultivation the Dunes of d'Anglet."

We have had a parliamentary commission reporting as to the millions of uncultivated acres within the United Kingdom. When may we expect some well-arranged scheme for making these vast territories tributaries to the national wealth?

Having pointed out where land is to be found in abundance for those desirous to engage in its cultivation, we now proceed to consider how far the subdivision of land can be profitably carried.

Having carefully perused many accounts of the condition of the population of those kingdoms where the possession of land is widely diffused, we find all travellers agreed in declaring that the effect on the general happiness is strikingly and universally beneficial, save in the case of unhappy Ireland, which is so plainly exceptional, and so much the result of peculiar circumstances, as not to contradict the general law that the possession of land is a most desirable industrial occupation for a large proportion of the people. In Mill's *Political Economy*, in Alison's *Principles of Population*, in Thornton *On Over-Population*, and in many other recent productions, there is a great deal of most interesting information as to the effects resulting from the acquisition of landed property by the poor. So far back, however, as 1805, we find Lord Winchelsea thus recording his experience: "Upon my estate, in the county of Rutland, there are from seventy to eighty labourers who keep from one to four cows each. From what I have seen of them, I am more and more confirmed in the opinion, which I have long held, that nothing is so beneficial, *both to them and to the land holders*, as their having land to be occupied either for the keeping of cows, or as gardens, according to circumstances. The labourers live better, they are more contented, and more attached to their situation, and acquire a sort of independence which makes them set a high value on their character. In the neighbourhood where I live, men so circumstanced are the most to be depended upon ... [illegible]sted; the possession of a little property certainly gives ... industry. As a proof of this, it has almost always happened that, when a labourer has obtained a cow, and land sufficient to ... [illegible] has thought of has been how h

could save money to buy another; and I have always had applications for more land from people so circumstanced." "It might be apprehended," says Sir Thomas Barnard, "that such an increase of property would induce them to trust to the produce of their cows and gardens for the support of themselves and their families: but the fact is directly the reverse. Such are the beneficial effects of early and steady industry, that these little proprietors are invariably the most industrious and trusty labourers." *

It will not do to ignore the testimony of such intelligent witnesses simply because given fifty years ago. The mode of raising the moral and physical condition of the people which they advocate is still in beneficial exercise. From the reports of the Labourers' Friend Society we learn that a modification of it has been introduced into the midland counties of England, with the view of supplying healthful and remunerating occupation for the leisure hours of the operatives in the cultivation of cottage-gardens, containing a rood, or 1210 square yards, to be cultivated by manual labour alone, which, under good management, will supply poor families with vegetables all the year, and enable them to keep a pig. "About 600 acres, in 2400 allotments, have already been let; the artisans manifest great eagerness to avail themselves of the privilege, and," adds the agent, "I have been told by several of the men that they should have been lost entirely during the late depression, if it had not been for small gardens in their possession, much less than a rood. The good, physically and morally, is incalculable that would result to our manufacturing operative, if he could turn out morning and evening, when he ordinarily goes to the gin or beer shop, to an hour or two's labour at his garden."

In localities where the allotment system prevails, it might have been anticipated that pauperism would be sensibly diminished. We have proof of this in the statistics of four rural parishes in Rutlandshire (referred to vol. xli. of the *Quarterly Review*), where the assessment on property was more than twelve times less heavy than in four similar parishes in Suffolk, where the industrious habits of the people have not been fostered by allowing them the possession of land. In Number 81 of the same Journal an instance is given of a parish in which, so long as the poor were allowed plots of land, the poor-rates were almost nominal; but these plots having been withheld, a rate of 3s. per pound became necessary before another generation had passed away!

To increase the number of the people interested in the cultivation of the land has, therefore, no tendency to promote the growth of a population of paupers, or to distract manual labour from what our political economists are pleased to term "its proper field of employment."

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* *Reports by the Society for Bettering the Condition of the Poor*, vol. i.

We would console the Malthusians, who dread redundancy of the people, by directing them to the statement of Dupin, "that the population of Britain is now doubling itself in 42 years, Austria in 69, Russia in 66, and France in 105 years." In manufacturing Britain population advances much more rapidly than in those countries which are more agricultural. So that the nearer we recur to our pristine condition, as tillers of the ground, the more remote are we from the dreaded evil of a superabundant increase of the human species. But from this condition we are rapidly receding, for, observe the Census Commissioners in their last decennial Report: "It is one of the obvious physical effects of the increase of population, that the proportion of land to each person diminishes; and the decrease is such, that, within the last fifty years, the number of acres to each person living has fallen from 5.4 to 2.7 acres in Great Britain, from 4 to 2 acres in England and Wales." The same authority informs us that "the populations of the towns and of the country have become equally balanced in number—*ten millions and a half against ten millions and a half.*" What then shall be our future? Is the townward movement of the population to go on in a rapidly accelerating ratio? And because "man made the town," are we to become more and more unmindful of the poet's assertion that "God made the country?" Whatever be the issue, we conceive that, when speaking of "the proper field" for the employment of manual labour, our political economists take too much upon them when presuming to say to the labourer, that never on land of his own should he aspire to ply his plenty-producing spade. *That* is the very field in which we should wish to see him employed, in reasonable numerical proportion to other classes of the people.

But supposing that the small-farm system is not likely to over-people the land, or stock it with paupers, it remains to be proved that its adoption is advisable as a means of adding to the national supply of food. We can point alike to the experience of nations and individuals in proof of the fact that the industry of the small farmer is rewarded abundantly, so that he has enough and to spare. Mr Thornton, in his *Plea for Peasant Proprietors*, thus sets forth the political economy of encouraging small farms: "It appears that in the two principal Channel Islands the agricultural population is in the one twice, and in the other three times as dense as in Britain, there being in the latter country only one cultivator to 22 acres of cultivated land, while in Jersey there is one in 11, and in Guernsey one in 7 acres. Yet the agriculture of these islands maintains, besides cultivators, non-agricultural populations respectively four or five times as dense as that of Britain [illegible]irely owing to the assiduous care of the farmers, and the [illegible] of manure. One thing which, by itself, might serve to [illegible] markets are better supplied by small than by large farms

is the fact that land, when divided among many occupiers, commonly pays a much higher rent than when united into one extensive holding. Thirty shillings an acre would be thought in England a very fair rent for middling land; but in the Channel Islands it is only very inferior land that would not let for at least £4; and in Switzerland the average rent seems to be £6 an acre."

In answer to this, it has been said that "we would require a wider field of induction than the Channel Islands," and that "dependencies on great empires are not the safest examples for these empires, or for any other independent States. They are liable to be either oppressed or pampered; and there is reason to believe that the Channel Islands have enjoyed all the advantages, and suffered scarcely any of the evils, of dependence on a powerful nation." *

We cannot see the force of this statement. To oppress the cultivator is not a likely mode, we should think, of stimulating his industry to develop the utmost capacity of the soil. If liable to be plundered, he does not "work with a will." If "pampered," he is, of course, lazy, and the State is very far from duly benefiting by his toil. And as to "the field of induction" (from which we gather arguments in favour of land being largely possessed by the people), so far is it from being limited, that it may literally be said to spread "from Indus to the Pole." In the wide territory of the Punjaub, as well as in the penal settlement of Siberia, the possession of land is found to be a source of comfortable subsistence to the small proprietor. Mr Cochrane assures us that in the latter country "the government convicts have ample time to work their lands, and reap abundance of corn and vegetables." †

If in such a region, where assuredly the cultivator is neither favoured by the climate nor "pampered" by the government, plenty rewards the toil of the peasant convict, we need not be surprised to learn that in England fourteen quarters of wheat have been obtained from land dug by the spade, and that the average profit derived from cottage allotments is £20 per acre. ‡ This result is very nearly threefold more than was anticipated by the sagacity of the late Sir John Sinclair, who calculated the profits of a three-acre farm at £21, exclusive, however, of £25 derived from the united labour of the proprietor and his family. The general result of the allotment system, as practised most extensively by the Labourers' Friend Society, is said to be this: Besides a greatly increased production, the landlords have as regular and as ample rents as from any class of tenants; the farmers have found their labourers more

* *Political Economy.* By JOHN HILL BURTON, p. 197.

† *Travels in Siberia*, vol. i. 190.

‡ Evidence before Committee on Allotments of Land, 1843. An instance has occurred of a man growing a crop worth £5 on the eighth part of an acre of very indifferent land!

steady, active, and intelligent; pauperism and crime have largely diminished. In one parish the poor-rates were redu a few years from £206, 8s. to £4, 12s. 6d.; and in another, course of one year, from £3200 to £2000. In the publicat this Society instances are given of men of vagrant, dishone immoral habits becoming industrious respectable members community, in consequence of being put in possession of an ment.

With these facts before us we cannot refuse assent to tho argue that the distribution of land among our agricultural lab seems to be not only entirely free from the dangerous conseq with which many writers imagine it to be fraught, but that it haps indispensable to the restoration of that noble yeomanr strength and honour of England, and of "that bold peasantry country's pride," whose almost utter extinction is now th ject of such frequent lamentation. Believing that such a would be alike profitable to the great landholder and the sm prietor, we say with John Bellers, who in 1696 issued propo raising a "College of Industry:" "I intend the profit of whilst I think the method will afford both profit to the ri plenty to the poor. I will not pretend to seek any method ing in this world that hath no inconveniency in it, but only wh fewest. But till the rich be satisfied to put it afoot, the po not if they would, for want of material." Instead, therefore, pressing the mind of the labourer by the hopelessness of eve above dependence on daily wages, so that, to use the home guage we lately heard from a farmer's daughter, "he gets a dozend and stupid-like, because he thinks he canna mak a bett let us cherish his independence, sweeten and encourage his toil by infusing into his heart the hope of improving his con so that he may reasonably expect to be able to say of his littl ing and his commodious cottage, "*This is mine.*" Every m can say this of anything acquired by honest industry is on t to improvement in all that constitutes the happiness of civili istence. To attach the hardy race of rural labourers to thei try and their lot not much is needed. The cottager, unu change of place or occupation, centres his desires in the spo he was born, and in the family to which he has given birth. sity may drive him, temptations may seduce him to be a wand distant lands; but his heart will always joyfully answer to t which invites him back to his family and his home. It is al expedient and cruel so to treat him as to sour his spirit, and him little reason for congratulation that he dwells in a land in [illegible] something to lose, and much to love. That he ha [illegible] to fall into a position which it is painful to contem unhappily notorious. The subject we have been considering is [illegible] shall probably recur to it, with the inter

iting out the beneficial application of the principles we have been ocating, and of endeavouring to remove the objections of those n whom we have the misfortune to differ in opinion as to the ortance of the possession of land as an industrial occupation for people. Meanwhile we are very anxious to attract public at- ion to the fact that Scottish labourers are rapidly abandoning r predilection for their native land, and availing themselves, great numbers, of the advantages offered to emigrants. For ral years we have been constantly endeavouring to show the olicy of allowing the supply of rural labour to verge towards a imum. But we have spoken and written in vain! The result hat there is at present going on something like that national dus which has so largely reduced the population of Ireland. hardly take up a newspaper without being furnished with new lence of this accelerated movement of our labourers to foreign es. In the *Times*, for example, we were lately informed that ng this spring 1500 people have left the east coast of Scotland Canada. In a Glasgow journal we read of a novel export the Clyde, in the shape of about twenty-five agricultural urers and their families sailing for Turkey, where they are to mployed in introducing the Scotch system of farming amongst Turks and Greeks, upon an extensive estate acquired by Mr mas Parry, in the neighbourhood of Constantinople. In the ff *Journal* we are informed that the great rise in the wages of cultural labourers is exciting universal attention; and this rise ainly attributed to the great number of farm-servants and l farmers who have betaken themselves to Canada and to Aus- a: the numbers of these classes emigrating from the north of land amounting to several thousands annually for the last few s. We have no doubt that in most instances these emigrants done wisely in leaving their fatherland. Will their depar- be for the good of us stayers at home? We trow not. If holders be of the same opinion, it is more than time that they ld be devising measures to arrest the expatriation of those y and easily-satisfied sons and daughters of toil, whose labours done so much to raise the reputation of Scottish agriculture. have suggested one remedial measure of easy and extensive cation. It is worth while to try it.

PHYSIOLOGY OF BREEDING.

THE breeding of our most valuable domesticated animals ha hitherto been carried on in a manner almost wholly empirical. A few general phenomena, which appear to be established as facts by the results of trial and experience, have been the sole guides in a matter which has so important a bearing on the interests of agricul- turists, and therefore on that of the community at large. Sound physiological principles, and the laws which regulate the reproduc- tion of animals, have continued to be most imperfectly known and notwithstanding the progress that has been made in othe departments of physiology, little has recently been done in this calculated materially to improve our practice. Our practice accordingly, has never been placed on a scientific or systemati foundation, and has continued to be pursued, as might have bee expected, with very varying and often most unsatisfactory results

The subject, it must be admitted, interesting and important a it is, is beset with difficulties. It is connected with some of th most latent and mysterious operations of nature—operations in great measure removed from our observation, and many of whic we may probably never be in a condition satisfactorily to explain The results are continually liable to be modified by circumstance which we can neither appreciate nor control, and they will there fore often disappoint expectation, and be found, in many cases at variance with our experience in others. The theories whic have been advanced on this subject are for the most par unsatisfactory, because they do not account for all the pheno mena, and many of the facts adduced in their support admit o explanation on entirely different grounds. The best of them ca be regarded as presenting only partial views of the truth, an their admission, as a whole, appears calculated to lead into erro Still, however, some of them are interesting and ingenious, an have thrown no inconsiderable light on the subject by eliciting multitude of new facts, as well as by the discussion to which the have given rise, and the interest in the question which they hav tended to excite.

The subject is a very extensive one, and a full view of it woul include the whole physiology of generation. Into this, howeve it is not our purpose to enter, as it is of too complex and abstrus a nature to be adequately treated except in works expressl devoted to science, and is not in other respects suited for full di cussion in our pages. But it may be useful to make our reade acquainted with some of the views which have recently bee given on the physiology of breeding, especially such as seem ca culated [illegible] have an influence on practice, and to state the fund [illegible] principles which appear to be established on grounds th [illegible]

The transmissibility of the properties of parents to their offspring — the great principle on which all improvements in the breeding of animals is founded—is one of those obvious facts which could not fail to be recognised from the earliest times. We give expression to it in the common aphorism, "Like produces like;" and as heritage, while it manifests itself in all cases on the physical qualities, extends also in man to the intellectual, influencing alike the body and the mind—so, in animals, it equally affects the temper, disposition, and instincts—all, in short, which in them is analogous to mind in the higher race. In this resemblance we may remark two kinds, or rather two degrees of the same thing; one of them is of a general nature, and has reference to the species. No law of nature is more fixed and invariable than that animals should procreate their own kind—that is, their own species. The offspring inherit the general organisation of the parents; and it is indispensably necessary that it should be so, for the preservation of the species. The fortuitous mixture of different species by interbreeding is guarded against with the most jealous care; and we believe that, among the higher race of animals—that is, quadrupeds —it very seldom occurs when they are left to themselves in a wild or natural state. In a domesticated condition, their instincts changed through artificial influences, the intentions of nature are occasionally thwarted, and distinct species breed with each other. But when the barrier which nature has set, in the repugnance which every animal feels, in this point of view, to every species but its own, happens to be overcome, how effectually is the limit prescribed to this abnormal state of things, by the speedy sterility of the mongrel race! The tendency to aberration is thus checked almost as soon as it has commenced; indeed, were it otherwise, universal irregularity and confusion would take the place of the beautiful order and harmony which now prevail, and many of the principal races would probably become altogether extinct.

But besides this general or specific resemblance between parents and their offspring, there is also a particular or individual resemblance: the former insures the identity of the progeny with the race to which the parents belong, the latter indicates their connection with particular parents. Many of the special or individual qualities of the parents are thus reproduced in their descendants; they are reflected, as it were, from a new being; and parents may be said to live anew in their offspring. This resemblance is often as obvious, and as generally recognised, as the other. We have daily and familiar examples of it. Aristotle mentions a race of people among whom the marriage tie was not recognised, and the children had parents assigned to them from resemblance. Particular families are well known to have been distinguished for many successive generations for certain peculiarities of figure, complexion, or features; and in early stages of society they often had

distinctive names given them from these peculiarities. "I speaks of a family in Thebes, every member of which w with the mark of a spear-head on his body; and although I is not a good authority for such a fact, we may accept this, it belongs to a class of well-authenticated cases. An family had the same sort of mark, and hence bore the r *Lansada.* Haller cites the case of the Bentivoglie family, i a slight external tumour was transmitted from father to soı always swelled when the atmosphere was moist. Ag Roman families *Nasones* and *Buccones* indicate analogou liarities, to which may be added the well-known 'Austr and 'Bourbon nose.' All the barons de Vessins were have a peculiar mark between their shoulders; and by m such a mark La Tour Landry discovered the posthumous mate son of the Baron de Vessins in a London shoemaker's tice." * This resemblance, however, though so frequent, is well known to be not invariable. Very many exceptions a tinually occurring, both in the human race and in animal in the physical conformation, and in the mental constituti both, the most marked disparity is sometimes observed in b even in the case of twins, when the connection may be sa closest. It is possible, however, that many exceptions aı apparent than real; for we are inclined to think that if circumstances were known to us, to enable us to form an regarding each, which is scarcely possible in any one c should find points of resemblance where ordinary observatio not lead us to suspect them. It has often been observed, ample, that family likenesses, not previously noticed, visible after emaciating illness or after death. How is th accounted for? Simply because the likeness has resided chiefl configuration of the bones of the face, and when the muscles attenuated and collapsed, the configuration of these bones g contour and expression to the integuments now drawn close them. At one period of life individuals frequently show blance to their parents, and not at another; and a peculiar into which a man may happen to be thrown, brings out qualities and character, which otherwise might have been latent, proving from what blood he is sprung. But what is nay not be hereditary? Not only the ordinary qualities c and mind—not only diseases, constitution, longevity—but ev yncrasies, habits, and peculiarities of structure arising frc lent. In short, as we are assured by M. Girou de Buzar ne of the greatest authorities on this subject, there is not n animal which may not be transmitted by generation.†

f ... the case, it evidently puts a great deal into th

* ... No. lix., p. 140 † De la Generation,

of breeders of stock, and affords ample scope for their operations. Every desirable quality that can be found in any one animal capable of propagating its kind, may, by proper management, become fixed and perpetuated in its offspring, and that, in its turn, may continue the improved race. But in order to produce this "paragon of animals," and to enable us to estimate correctly the result of our combination of means, it is necessary that we should discover the influence which each parent exercises on its offspring —the particular portions of its frame, if any, which it derives from the one or the other, the mode and degree in which the qualities of both are blended, and other particulars of a like nature. If we could acquire an accurate knowledge of these, much or all uncertainty would be removed from the process, and we should look with assurance for the results which we had provided means to produce. The object is one of obvious importance, and several attempts have been made to attain it.

Many years have elapsed since opinions were put forth by various authors, as to the parts to be assigned to the respective sexes in the organisation of their joint produce. Many of these inclined to the opinion that the influence of the male predominated over the exterior life, that of the female over the interior life of their progeny. The words of Vicq-d'Azyr, a distinguished physiologist, as quoted by M. Girou, are to the effect that, in regard to mules, "the exterior and the extremities appear to be modified by the father, and the viscera (*entrailles*) to emanate from the mother." Buffon expresses a similar opinion, and that of M. Girou very nearly corresponds, although it is qualified by very many modifying circumstances. Quite recently a similar theory has been advanced by Mr Walker,* and Mr Orton of Sunderland,† but they have carried it much farther, and have indicated with the utmost precision the different parts of the body, or groups of organs, which they conceive to be due to each of the parents. The share of each is so distinctly defined, and the subject assumes in their hands such a degree of simplicity, that were their theory in every respect unexceptionable, the problem of reproduction, as far as the breeder is concerned with it, would admit of nearly as easy solution as one of geometry.

Although Mr Walker's and Mr Orton's theories so nearly correspond, they have been excogitated independently of each other, but the former has the claim of priority: as the latter, however, considers the subject more particularly in reference to the breeding of animals, we shall take the exposition of their joint views chiefly from him. The first law which he lays down is, that the male gives the external configuration—or, in other words, the locomo-

* *On Intermarriage.*
† *On the Physiology of Breeding:* Two Lectures. By REGINALD ORTON, M.R.C.S., Sunderland, 1855.

tive organs; while the female gives the internal—or, in otl words, the vital organs. Referring to Mr Walker for furtl details, we find that under the former head (the locomotive orga he includes the bones, the ligaments, the muscles, the shape, t limbs, and the skin. Under the latter he comprehends the org of absorption, of circulation, and of secretion; the digestive, spiratory, and reproductive systems, together with the fat, mi and other animal products. The lines of the body, the mann action, health and constitution, are dependent on these organs a their functions. Proceeding to the application of these principl Mr Walker concludes that the male parent communicates the p terior part of the head, the lower middle part, the cerebel, and t whole of the locomotive parts. The resemblance to this parent consequently found in the back-head, a few of the more moval parts of the face, as the ear, the under lip, eyebrows, and exter form of the body, in as far as they depend on the muscles. T female parent communicates the anterior part of the head, t upper middle part, the osseous or bony part of the face, the for of the organs of sense (the ear, upper lip, and lowest part of t nose), the thoracic and abdominal viscera. The resemblance this parent is consequently found in the forehead and bony parts the face, as the orbits, cheek-bones, jaws, chin, and teeth, as w as the shape of the organs of sense and the tone of the voice.

Overlooking the fact that these statements are not very consist with each other, it tends not a little to shake our confidence in t whole theory, to find Mr Walker declare that, in regard to t human race, the male or the female parent may give either ser of organs; that is, either forehead and organs of sense, with t vital and nutritive organs, or the back-head, with the locomoti organs. If the rule does not hold with regard to the most higl organised beings, what assurance can we have of its validity in t case of those which, although inferior, approach nearest to them structure? Or what shall we think of the definition of a vi system which excludes, as Mr Orton is inclined to do, the he and circulatory apparatus, and classifies them with the locomoti organs? (See p. 6.)

Many facts can readily be adduced in support of the views whi have just been explained, and we readily admit that they tend, *some degree,* to confirm them. Not a few of them, however, adr explanation on different grounds, while there is a large class facts directly opposed to the theory in question, and many oth which very partially conform to it. We cite more willingly umber of these facts, because they are interesting in themselv and illustrate the physiology of reproduction, independently of a heory with which they happen to be connected.

The examples of interbreeding between the horse and the ... because from their dissemblance, th

afford a good opportunity of tracing the influence of each; and Mr Orton's first illustration is derived from these. As we shall have occasion afterwards to advert to other instances of interbreeding between different species of this genus, we may premise that the group Equidæ is of very limited extent, and at once distinguishable from all others bearing any relation to it, by being solidungular, or having the hoof undivided. Although the species, which do not exceed a dozen in number, are often pretty strongly contrasted in external appearance, their structure is very much alike; and as the group is a remarkably natural one, and there is no great disparity in size, there can be little doubt that they might all be brought to breed with each other promiscuously. Three types are observable among them,—the Equine, including true horses; the Asinine, or asses; and the Hippotigrine, or cross-striped species —namely, the zebras and quaggas.

"The mule," says Mr Orton, "the produce of the male ass and mare, is essentially a modified ass: the ears are those of an ass, somewhat shortened; the mane is that of the ass, erect; the tail is that of an ass; the skin and colour are those of an ass, somewhat modified; the legs are slender, and the hoofs high, narrow, and contracted, like those of an ass. In fact, in all these respects it is an ass somewhat modified. The body and barrel of the mule are round and full, in which it differs from the ass, and resembles the mare.

"The hinny, on the other hand, the produce of the stallion and she-ass, is essentially a modified horse: the ears those of a horse, somewhat lengthened; the mane flowing; the tail is bushy, like that of a horse; the skin is fine, like that of the horse; and the colour varies, also like the horse; the legs are stronger, and the hoofs broad and expanded, like those of the horse. In fact, in all these respects, it is a horse somewhat modified. The body and barrel of the hinny are flat and narrow, in which it differs from the horse, and resembles its mother the ass. It is clearly evident that these two hybrid animals have followed the male parent in all his *external* characteristics. In two respects there is, however, a striking departure from him: 1st, In size they both follow the female parent, the mule being in all respects a larger and finer animal than its sire the ass; while the hinny is just the reverse, being flat and narrow. In this respect the mule is just the reverse of its sire the ass, while the hinny is just the reverse of its sire the horse; while both also, in this respect (the body and barrel), resemble their female parent." From this the author infers that the offspring resulting from this cross is not simply a mixture of the two parents, nor is it an animal that has accidentally a similitude to one or other of its parents. For, 2d, We perceive that we can produce a mule or a hinny at will, by using the male ass in the first instance, or the stallion in the second. 3d, We see

that the produce follows its male parent in its external characteristics,—its ears, its mane, its tail, its skin, its colour, its legs, its feet, are those of the male; but its body and barrel are those of the female parent.

This is perhaps as favourable a case for Mr Orton's theory as can be found, and we readily admit that it indicates a part of the truth, although, when compared with other facts, we cannot but perceive that it fails to indicate the whole truth. It would have told more effectually in his favour, if he had not attempted to carry it further; but he congratulates himself on the further support his views receive from the peculiar voice of the ass and the hinny. "The mule *brays*, while the hinny *neighs*. The why and wherefore of this is a perfect mystery, until we come to apply the knowledge afforded us by the law I have given. The male gives the locomotive organs, and the muscles are among these; the muscles are the organs which modulate the voice of the animal; the mule has the muscular structures of its sire the ass; the hinny has the muscular structures of its sire the horse; the organs of voice in the former are those of its sire the ass, hence it brays; the organs of voice of the latter are those of its sire the horse, hence it neighs." (P. 7.) Now the organ of inarticulate voice, common to all mammals, is the larynx, hence called the laryngial voice, to distinguish it from the oral voice, the organs of which are the lips, tongue, and teeth. The harsh voice of the ass—the *bray*, according to Cuvier,* is owing to two small peculiar cavities at the base of the larynx. The structure, therefore, from which the braying of the ass derives its peculiar character, belongs, not to the locomotive, but to the internal part of the system, which, according to the theory, belongs to the female parent. Mr Walker, indeed, expressly states (as will be seen on a former page) that the tone of the voice comes from this sex. If the mule brays, therefore, it derives that property, it is true, from the male; but, according to the just interpretation of the theory, it should come from the female—it ought to neigh. According to the same principles, the hinny should bray; but that peculiarity is neutralised by the superior potency of the male parent, the stallion. Both cases thus tell against the theory. Other facts, bearing on the same point, lead to a similar conclusion. "The produce of a dog and a she-wolf sometimes bark and sometimes howl, according to Buffon; and the produce of a bitch-fox and a dog, according to Burdach, barked liked a dog, though somewhat hoarsely, and howled like a wolf when it was hurt. A similar remark has been made by all who have attended to cross-breeding in birds; the hybrid of the goldfinch and the canary has the song of the goldfinch, mingled with occasional notes of the canary, which seem perpetually about to gain the predominance. Finally,

* [illegible] Animal, vol. i. p. [illegible]

we know how, in the human family, a magnificent voice is inherited from a mother as often as from a father." *

According to the theory under review, there is no point in which the male influence should be more obvious than in the colour and qualities of the skin. It unquestionably belongs to the external configuration, and is so indicated by Mr Walker. It ought to derive its qualities, therefore, from the male parent. How far do facts justify this inference? A cow of the Swiss race, having a white skin spotted with red, is mentioned by M. Girou as having produced five calves, only one of which, a female, resembled the bull, and four males, which were like the mother both in the ground-colour of the skin and distribution of the spots. Instances of this nature have been observed by every one in possession of a herd of cattle: it is never expected that the produce should always resemble the bull in colour; even though his colour may predominate in a herd, sufficient variety never fails to appear. Black and white kittens are every day produced from cats, one of which is wholly black and the other wholly white; a black buck and a white doe have produced at one time a black and white fawn, and at another time one entirely black, except a spot above the hoof. Buffon mentions the very conclusive case of a she-wolf which had two cubs, a male and female, to a setter-dog. The male resembled the father in external appearance, except that the ears were pointed, and the tail like that of the wolf; the female resembled the mother, and had all her characteristics, with the exception of the tail, which was that of the dog. Here the external features were, in the one case, communicated by the father, in the other by the mother, completely inverting the arrangement which the theory under review teaches us to expect. Instances of the same kind might be multiplied to any extent.

No function can be more directly referred to the internal or vegetative system than the secretion of milk, and we should therefore expect the selection of cows to be the chief object in breeding for the dairy. So far is this from being the case, according to M. Girou, that he says the proprietors of cows have remarked that it is more important to the perfection of their dairy to make a good choice of bulls than of heifers, because the property of giving much milk is more surely transmitted by the male than by the female; "but does not this fact," he adds, "which I consider very constant, because I have observed it very often in my own byres, indicate that the male has often a great influence on the sexual organisation of the female products?" Against this great authority we adduce the more readily the opinion of Mr Orton, because we conceive that both are somewhat in extremes, and that the truth lies between them. "We may buy our £1000

* *Westminster Review*, No. xix., p. 147.

bulls, take them where we will, and put them to cows in the vital organs are not largely developed; we may take spring back again and again to the same, or the like organised bulls, but we shall never sustain the breed: \ and shall keep in a great measure the external appearanc short-horns [of which breed he is speaking], but the vital will not be those of the breed—the powers of secretion will those of the short-horns. I would ask, have we not alre many such animals, got by the best bulls, yet falling short milking and fattening properties?"

The experience of practical men is equally at varianc what share each parent has in the joint produce. The A are generally said to be much more careful as to the o their mares than that of their stallions; and this circum among a people who attend more to the genealogy of hors many other nations do to that of their first families, can the effect of long-continued observation. This, General I who has written on Arabian horses, and has had long exp does not hesitate to deny, asserting that the testimony Arabs is in favour of the stallion. Abd-el-Kader, another cal authority on this point, is inclined to acquiesce in th opinion, affirming that the essential parts of organisatio from the male, the mare merely imparting *her colour* an resemblance to her structure. An individual, who travers for the express purpose of giving evidence, has publisl opinion, of a precisely opposite purport; namely, that it is tl whose influence preponderates in the foal.*

A fair interpretation of the evidence thus briefly adduc prevent us acquiescing in the law as laid down so absolut trenchantly by Messrs Orton and Walker. However con such a law might have been, and attractive from the faci promised in conducting breeding operations, it by no mea forms to the general body of facts, and can be received on very considerable modifications. Indeed, as the cases pas view before him, the conviction dawns on Mr Orton's mi he has been too precise, and that he must relax the rigour definition. "I do not mean to imply or state that in a the law operates with the precision I have above stated, fc are certain controlling influences which confuse and modi in some cases *almost seem to set aside the law.* I do not o be inferred that either parent gives either set of organ luenced by the other parent, but merely that the leadi [illegible]teristics and qualiti[illegible] of both sets of organs are due to tl [illegible] one side and th[illegible] emale on the other, the opposite [illegible] [illegible] have seen Mr Walker's ad

* [illegible] Review. No. [illegible] p. 14[illegible]

that it is by no means of universal application in regard to the human race—nay, that the very reverse is frequently exhibited.

The conclusion to which a survey of the whole evidence on this point leads is, that both parents are represented in the offspring, but that it is impossible to say beforehand what parts of the derivative system are to be ascribed to the one parent, and what to the other. There is a blending or interfusion of the qualities of both, bodily as well as intellectual, which prevent the body of their progeny being mapped out into distinct regions, or divided into separate sets of organs, of which we can say, "this is from the father, that from the mother." While both concur in the production of a new life, they often neither concur equally, nor under constant relations in each sex, nor under the same relations in both sexes; an irregularity the greater and more frequent the higher the organisation to which the animal belongs.* At the same time, and in ordinary circumstances, the male influence frequently preponderates in one direction—namely, in the exterior forms, or, as they are at other times called, the locomotive organs or animal system; while that of the female preponderates in the internal, vital, or vegetative system. This tendency, however, is too uncertain to be calculated upon, or to be expressed in the form of a law; it may be modified, counteracted, or completely neutralised, by some of the alterative and disturbing causes afterwards spoken of; and it frequently happens that the case is wholly reversed, and we can trace the exterior life to the mother, and the interior to the father.

One of the great disturbing causes in breeding just alluded to, and one which often leads to disappointment, has been long known, but it has only of late been fully investigated, and found to be of very general operation. It is thus expressed by Mr Orton, as his second general law. The female system imbibes certain influences from the male, which modify her future progeny by other males. This fact was first brought prominently into notice by a quagga stallion being allowed to breed with a thoroughbred chestnut mare; and the hybrid thus produced presented, as was to be expected, distinct marks of the quagga, not only in the form of certain parts of the body, but in the crossbars which are so distinctive of that species. Subsequently, in three different years, the last of them at an interval of six years from the first trial, the same mare was covered by a black Arabian horse, and the three foals successively produced all bore unequivocal marks of the quagga. Precisely similar results were obtained from the intercourse of a zebra and a mare, the subsequent produce, by two different stallions, showing unmistakable marks of affinity to the zebra. These are cases in which this remarkable tendency would be most prominently

* De Girou, *De la Generation*, p. 207.

brought out, for the two sexes belonged to different species, a
according to M. Girou, the predominance of the male influe
becomes the more sensible in proportion as the family, race
species of the father differs from the family, race, or species of
mother. The same results have been observed from the in
breeding of an ass and a mare, and they have been equally es
lished in regard to animals of the same species. "Thus, in se
ral foals in the royal stud at Hampton Court got by the h
Actæon, there were unequivocal marks of the horse Colonel
which the dams of these foals were covered the previous y
Again, a colt, the property of the Earl of Suffield, got by La
so resembled another horse (Camel), that it was whispered,
even asserted, at Newmarket, that he must have been go
Camel. It was ascertained, however, that the only relation w
the colt bore to Camel was, that the latter had served his mo
the previous season. In further illustration of this point, I be
adduce an interesting statement made by Professor Low. A
remarking that 'there is sometimes difficulty in getting a thoro
bred mare to breed for the first time with a thoroughbred ho
and that 'in this case, in order to cause her to commence breed
a coarse stallion is put to her,' Professor Low adds, 'but
effect never fails to be seen in the progeny, the coarser chara
of the first male reappearing, however highly bred the subseq
stallions may be.'—'A pure Aberdeenshire heifer was served
a pure Teeswater bull, by which she had a first-cross calf.
following season the same cow was served with a pure Aberd
shire bull; the produce was a *cross* calf, which, when two y
old, had very long horns, the parents being both polled. Ag
a pure Aberdeenshire cow was served, in 1845, with a cross
—that is to say, an animal produced between a first-cross cow
a pure Teeswater bull. To this bull she had a cross calf.]
season she was served with a pure Ayrshire bull; the produce
quite a cross in shape and colour.'"* Sheep, pigs, dogs, pou
in fact, all our domesticated animals, have exhibited the like
nomenon, and it may, therefore, be regarded as a general law.
part of the subject has been carefully investigated by Mr O
and he has illustrated it by many new and interesting cases, o
ring under his own observation. These our space does not pe
us to extract; we must therefore refer for them to the work i
There is one, however, in which the results are so conspic
that we must avail ourselves of it. Silk fowls are remarkable-
ng birds, because they have a downy or silky plumage, a l
kin and face, black bill and mouth, black legs, and dark or
lack bones. These peculiarities, so strongly marked, fit
... riment. The silk cock was crossed with a con

* ... ing, p. 4. By ALEX. HARVEY, M

bantam hen; the produce was some twelve or fifteen chickens, the whole of which had the black skin, black mouth, and five toes of the silk cock—his external development. Four of them (the rest having died in the downy state) had the black skin and five toes of the silk cock, but, strange enough, while three of them had downy plumage, the other had feathers. The feathered bird was the first produce of the silk cock and bantam hen, the other three were from eggs subsequently laid, and these have silky plumage. All these chickens would doubtless have been alike—that is, downy in plumage—but for some disturbing cause. What is that? The hen had been breeding with a common white bantam cock previously to her being put to the silk cock. Her first chicken, though so strongly marked as the offspring of the silk cock in skin, face, bill, and toes, had, notwithstanding, the feathers of the common bantam cock; her second, though silk-like in appearance, shows the white face and bill of the common cock; the third is almost essentially a silk fowl, and might be passed as such but for shape; and the fourth is still nearer the pure breed of the silk cock. Step by step the influence of the bantam cock has disappeared, and that of the silk cock predominated.

This last case may give us some notion of the length of time this influence is likely to operate; there can be little doubt that it gradually dies out; and probably will become extinct, in most cases, after a few births. It does not appear to happen invariably —a circumstance by no means at variance with explanation of the cause of it afterwards given. It is therefore, we fear, of too precarious and uncertain a character to be turned to much account in breeding. It should, however, be always taken into account, in our calculations, as an influence acting with considerable momentum either for good or evil, as the case may be. It presents us with the curious fact, that an animal, when dead, may influence the character of others afterwards to be born, and not even conceived at the time of its death. But it ceases to surprise us when we consider other analogous instances, of a still more striking nature, observed among the lower animals—insects, for example. In some of these, such as the aphis, one impregnation suffices for several generations. And the consideration of these leads us to acquiesce the more readily in the cause of this phenomenon, as explained by Mr Orton—an explanation which we shall give in his own words. Other theories have been advanced, such as the influence of imagination, and a process of inoculation by which the blood of the female is thought to acquire certain properties which operate on her subsequent progeny; but these views, when compared with the other, may be regarded as inadmissible. "My conviction is, that the action is confined solely to the ovarian system of the female. The ovaries are organs placed in the body of the female, and studded with ova or eggs in various stages of deve-

lopment. While the male influence is being exerted in gi vitality to one or more of the most highly developed of these the rest, *not so highly developed*, are also open to the same influ My view is, that these ova, which are sufficiently matured to on vitality, are fecundated, and pass to the uterine cavity, the be developed; while, at the same time, a number of the less tured ova receive an influence or impress, *short of vitality*, w remains by them, and modifies the subsequent action of the r which at another and after period gives them vitality." If explanation be the true one, it renders highly improbable the n which some appear to entertain, that a female, in the circumsta in question, can never afterwards produce a pure breed. It is the ova that approach maturity that can be affected; and whe these, whatever the number may be, have been vitalised and d loped, the rest remain intact, and the influence ceases. It w even appear, from a case mentioned by Mr Orton, that an im may be given to the ova by the male when the female prove fruitful, as is manifested in the young she may afterwards b forth.

Akin to the influence that has just been considered, in its ef but very different as to its cause, is what has been called *ata* or the transmission of properties, not visible in the parents, ancestors. A child may have no resemblance to its fath mother, yet be like its grandfather or grandmother, or ance still more remote. This influence appears, perhaps, most striki in the case of certain diseases, which, after manifesting thems in the most decided manner, become dormant even for some ge tions, and then break forth again with sudden violence. W familiar with this tendency in the human subject; it appears eq to prevail among animals. Hence the importance of pedigree the value of a stud-book, by which we can trace an animal b wards through several generations, and assure ourselves that inherited a sound constitution through a series of progen These remote hereditary influences must be supposed in all to be present in the immediate parents, and be communicate them to their offspring, but to be neutralised, when they f develop themselves, by some counteracting agency in one or or in both parents; and when that counteracting or contr influence happens to be withdrawn—or when, existing in th parent, the hereditary tendency meets with a corresponding c the other—it acquires strength, and displays itself in a m manner in the descendants. The qualities thus derived from a ..rs may be either good or bad, and the breeder can never b ..in of the permanent value of his stock till he has trac descent through several generations. Atavism is therefore o those causes which tend to complicate the process of breeding ... ne uniformit of its results

e mingling of the qualities of the two parents in their offspring, ll be inferred from what has been already said, must be rded as very variable in degree; one is often represented more ledly than another. This effect is sometimes produced by ncy of race. Some races are more permanent and confirmed heir character than others, and these characters assert their ominance over the more yielding system with which they are ded. Hence it often happens that a very long period of inter-ding must elapse before we can succeed in obtaining the desir- properties of both parents in anything like equal combination. Gerou says that attempts made in England to improve horses means of Arabian stallions, have been more successful with es belonging to no particular race, than with such as do belong race. He illustrates the principle by a case which occurred imself. He supposed that he would more speedily obtain fine l by crossing Roussillon sheep with Merino rams, than by ing the Aveyron breed with the same rams, but he was dis-ointed. The Roussillon race, being no doubt more ancient, and essed of greater potency (*force motrice*) than the Aveyron race, red greater resistance than the latter to the influence of the inos; and after twenty-five years of successive crossing, the iitive characters of the Roussillons still appeared, while the ses of the Aveyron race, after the same length of time, could be distinguished from the Spanish sheep.* It thus appears characters long established, and thoroughly incorporated with constitution by transmission through many successive genera-s, give to a race or breed a certain fixity of type—something he persistency and individuality of a species, by which it is led to resist, for a length of time, fusion with another race, continue to reproduce its leading characteristics. Something ogous to potency of race, is what may be called potency of the vidual, in which youth, health, and general vigour will give a onderating influence to the parent in which they exist, over of the parent in which they are deficient. All these circum-ces, the first mentioned of them in particular, exert a modify- influence, and must enter into the calculations of the skilful der.

he hereditary influences produced by a long continuance of ding between animals of the same race, and nearly related to other, so well known for their deteriorating effects, we can at ent only allude to; and our space will enable us to do little e in regard to the numerous class of diseases transmissible by nts to their offspring. These diseases are as strictly hereditary e case of animals, as in the human subject, where they are r known, and have attracted a greater share of attention.

* *De la Generation*, p. 307.

The danger assumes its most aggravated form in breeding-in-an(in, because then the constitutional tendencies are usually similar i both parents; there is no antagonistic influence, and everythin, tends to develop the malady. Besides the great majority of th diseases to which animals are liable, blemishes, or structural defor mities arising from accident, may become hereditary, although thi is not generally the case. Infirmities resulting from old age hav been observed to be transmitted as readily as if they had bee originally constitutional.

The facts of which we have spoken, and the inferences derivabl from them, comprehend the most important elementary principle of breeding. They may be regarded as laws of nature, and thei operation must be taken into account in all our practical proceeding The application of these principles is attended with considerabl difficulty, from the frequent want of the precise knowledge of a the circumstances which may have an influence on the result. Bu they point out to us in what direction that knowledge is to b sought, and in proportion as it is attained and applied will be ou success in breeding. A great variety of circumstances, as has bee seen, tend to complicate the process; in many cases these may b discovered, and their evil effect prevented; but great care an skill will scarcely prevent occasional disappointment. It is onl by eliciting fundamental principles, and guiding our practice b them, that we are likely to attain to any degree of certainty an uniformity of result. With the progress of general physiolog this important branch of it may likewise be expected to advanc enabling us to understand more fully the varied and comple phenomena presented by the reproduction of animals, and to stat with greater precision than is now practicable, the laws on whi(they depend.

One of the practical bearings of the principles which have be(explained is, that we can exercise considerable influence in dete mining the sex we wish to have produced. M. Girou has devot(much attention to the subject in this point of view, and in his ow stock he seems to have been able to breed any sex he pleased; least, to give a great preponderance either to one or the other. is on the greater or less comparative vigour of the individu breeding together that the sex of the produce depends. If femal are desired, it is necessary to employ young males and females the full vigour of life, and nourish the latter more liberally th the former. The inverse of this must be done if we wish to pr duce males. Such is Baron Cuvier's condensed view of M. Giro principles; but those who may wish to put them to the test experiment are [illegible] desire a greater number of details. W [illegible] his [illegible] directions, very nearly translating his ow word[illegible] produce males, the females should be int [illegible] immediately after they have had your

ot allowed to come into season in the absence of the male, in juence of too rich feeding. It is desirable that they should had young frequently, and suckled their offspring almost to ime of receiving the male. The females should not have ed, or they should have passed, the period of their perfect opment; and they should be rather lean than fat. They l be sparingly fed about the time of being brought to the n, and should take exercise. Females with a broad forehead, which resemble their father, should be chosen in preference. tallion should have reached his perfect development—neither oung nor too old; should have the forehead narrow, and ibling his father in his shapes and colour; should be in the r of health, and possessed of great muscular power.
it be our wish to obtain females, the individuals of that sex which we are to breed, should not be brought to the stallion they have well recovered from the fatigues of gestation and ıg; they should receive abundance of nourishing food, of a aginous nature, if they are herbivorous; they should be pre- d, before meeting the male, from taking exercise calculated ıt or fatigue them, and should come into season as a conse- e of temperament and nourishment, before being presented male; those should be chosen which resemble their mother; have a wide pelvis and a narrow forehead; which have d their full development, are neither too young nor too old, g a good appetite, and in full health and vigour. The stallion be very young or already old; should resemble his mother, ıve a broad forehead. He should be prepared by exercise ating diet, and he should have covered one or two females being presented to the one in question. M. Girou de Buz- nes gives other rules for breeding offspring resembling espective parents, but the above must suffice as examples.

IN the number of this Journal for March we observed that the popular mind in this country has of late become much more alive to the charming occupation to be found in the study of natural history. We find a new proof of this in the contents of the January number of the *Quarterly Review*. There are no less than three articles, respectively entitled "Ferns and their Portraits," "Rats," "The Salmon." The last of these attracted our attention, as well as that of a learned *pisciculturist*, who thus wrote to us: "A good article should, I take it, resemble a good trouting stream—be rapid and sparkling, but never shallow, and have occasional pools of thought." We are quite willing to admit that these, to a considerable extent, are the characteristics of the article in the *Quarterly*. We hope, however, that this "Triton among the minnows" will not swallow up us small-fry for presuming to hint that he is fairly among the *shallows* when thus *rapidly* arriving at the conclusion that *pisciculture* will not pay. "The peculiarity of *pisciculture* as applied to salmon is, that, as soon as you have brought your progeny past the perils of birth and infancy, you must let them forth to the world of waters *without the millionth part of a chance that they will ever return to reward their early benefactors.*" Are naturalists, then, we ask, romancing when they describe the unfailing return of the salmon to its native river? We can give no quarter to such piscine heresy. Our learned contemporary must hold us excused for declining to follow him into the shallows: we stick to what we deem the orthodox and ofttimes-demonstrated faith that salmon-fry, leaving a river in April or May, will certainly return in myriads in about from fifty to sixty days, and so astonishingly grown as to make them a coveted article of human food. We repeat that the result of the experiment at Stormontfield has proved that "salmon fit for the market can be artificially reared within twenty months after the deposition of the ova:" and that "as a commercial speculation the experiment will prove remunerating, provided it be carried out on an extensive scale;" as we know it will be by the English Salmon Fishery Company, on the beautiful little river the Dart, in Devonshire.

But the extent to which the experiment has been carried in Perthshire is sufficient to demonstrate that there is not a vague hope, but a certainty, of catching a very considerable proportion of salmon [illegible]ly reared. Before the result of that experiment [illegible]tained, we remember having a conversation with Mr [illegible], Conservator of the Tay fishings, as to the probable amount [illegible] returning to the river as grilses. At that time there [illegible] bearing upon this point [illegible] were able to inspire

Mr Buist with hope, by reminding him of Mr Shaw's experiment on the fry of the sea-trout. He marked 524, by cutting of the adipose fin, in the summer of 1834. Next summer he recaptured sixty-eight of them, of an average weight of 2½ lb. On these he put a second distinctive mark, and returned them to the river. Next summer (1836) he recaptured about one in twenty of these, averaging 4 lb. weight. Marking them for the third time, he returned them to the river. On 23d August of the subsequent summer (1837), he recaptured one of them, weighing 6 lb. So far, then, from there being "not the millionth part of a chance that they would ever return to reward their early benefactors," these sea-trout actually returned thrice to the Nith, their native river, and, on their first return, were captured in the proportion of more than a seventh of their entire number! The heart of the Conservator of the Tay Fishings was gladdened by the hope we held out to him that *his* fishy progeny would be equally sure to return within reach of his murderous devices! We rejoice that it has been fulfilled, as we learn from the "statistics of the Stormontfield Pond," with which he has obligingly furnished us. The following are the principal facts:—1st, Of the marked fish liberated from the pond, 4 per cent were recaptured either as grilse or salmon. 2d, More than 300,000 were artificially reared and liberated; forty out of every thousand were recaptured; and as 300,000 were liberated, it follows that 12,000 of the salmon taken in the Tay were pond-bred fish. 3d, The average annual capture of Tay salmon and grilse is 70,000; so that, of the fish taken in this river during the last two years, nearly a tenth were artificially bred. A tithe of actual captures is *rather* better than the *Quarterly's* dismal prognostic of the millionth part of a chance! The said tenth is equivalent to a rise of 10 per cent in the rental of the fishings; and such, we find, is the result.

Bearing in mind that the fishlings at Stormontfield were for a year kept from the dangers which, doubtless, far more than decimated their contemporaries in the open river, and that during all this time they were receiving abundant supplies from the careful hands of "Peter of the Pools," it is not surprising that we should have to record results so satisfactory. And that the increase in the produce of the Tay fishings is rightly attributed to pisciculture seems to be proved. There has been no similar increase in the produce of any other Scottish river. The salmon-fishing last year was deficient universally, with the exception of the Tay.

We have, therefore, the utmost reason to regard *pisciculture* as a certain method of speedily replenishing our alas! too many almost fishless rivers.

A friend of ours returning from India forthwith repaired to his native stream, to renew, as he fondly hoped, the piscatorial exploits of his youth. He toiled all day, but caught nothing save

a cruel pain in the back. Good, however, comes out of evil. Disgusted, he vowed to fish no more. Taking a last look at rod and tackle, he turned to his books for consolation. He found it in a French treatise on pisciculture. Fired with a vision of fins, he propagated the new idea, till at last it assumed a local habitation in the now famous salmon-rearing pond at Stormontfield.

Nature is no doubt a bountiful mother, but her system, notwithstanding, is founded on the principle that the larger creatures shall devour the smaller, and that all creatures in the first stage of their existence shall be exposed to innumerable accidents, tending very sensibly to the limitation of their numbers. The salmon is not only exposed to these natural causes of destruction, but also to the *malice prepense* of all-devouring man, whose wiles are so successful that recourse must be had to artificial rearing, unless we desire the almost total extirpation of this noble fish. We therefore take a lively interest in pisciculture, and have endeavoured to enlist the public feeling in its favour, by detailing the result of its introduction into Perthshire.

Considering how gratifying this has been to the fishing proprietors of the Tay, we are astonished at the small scale of their doings at Stormontfield. There is only one feeding-pond, of a quarter of an acre in size. A second is indispensable; because, as about half of the fry refuse to leave it at the end of the first year, newly produced fry cannot be introduced into the pond without the certainty of being devoured by their elder brethren. From the want of a second pond, no ova have been deposited in the breeding-boxes during last winter. And so a whole salmon-producing year has been lost for the sake of a small economy. Surely this is penny wise and pound foolish. As Dr Esdaile pointed out (in his printed letter to the Tay proprietors, 27th August 1853) the Stormontfield lade furnishes unrivalled facilities for rearing young salmon, without having recourse to an apparatus of breeding-troughs. If these are not taken advantage of, and if the successful result of the artificial rearing of young salmon do not lead to a great extension of their operations, we shall take the liberty of saying to the Tay proprietors that their wisdom is akin to that of the man who killed the goose that laid the golden eggs.

But as few are proprietors of a salmon river, we desire to impress upon all living near canal, lake, or stream, that, by transporting to it the ova of fish, any body of water may be stocked with valuable kinds of fish. This has been done on a most extensive scale in many parts of France, where fish are annually reared by millions. In addition to its commercial importance as a new branch of industry, and its social value as supplying a vast addition to the food of the people, this system opens a boundless field to scientific inquiry. In the Danube and the Rhine, the Elbe and the Spree, [illegible] other river in Germany—in the rivers and lakes

of Russia, and Northern Europe—in the lakes of Switzerland—in the rivers of France—there exist either species of fish which we do not possess, or varieties of species which we are not acquainted with. There is every reason for believing that very many, if not all, of them may be naturalised in our waters. We do not think there is exaggeration in the opinion of M. Isodore Geoffroy Saint-Hilaire, the learned Professor of Zoology to the Faculty of Sciences at Paris:—"Pisciculture is to our waters what agriculture is to our soil, and is also called upon to add largely to our alimentary resources."

For the information of those interested in the rearing of salmon, and perhaps anxious to have a sketch of the salmon-rearing arrangements at Stormontfield, we remark, that such a cumbrous apparatus is unnecessary. That patented by Mr Boccius, and containing 25,000 salmon ova, is only 2 feet long by 1 broad, and requires 4 inches depth of water. To obviate the inconveniences of breeding-boxes, which are not only expensive, but apt to collect insects which devour, and mud which smothers, the ova, Dr Esdaile suggests dispensing both with boxes and gravel, and depositing each egg in a little cup punched in either a plate of zinc or in a slab of coarse stoneware. Why not of strong coarse glass, which is now cheap, and in which small hollows could easily be made for the separate reception of each *ovum?* In about three feet square he calculates on depositing 20,000 ova, at a very trifling expense. In order that our readers may have a choice of fish-breeding apparatus, we advise them to examine that used by M. Coste, whose treatise on pisciculture, translated by M. De Valmont, and published by the enterprising Mr Thomas Ashworth, may be had of Simpkin, Marshall, and Co., London.

We have tried the patience of non-piscatory readers, doubtless;—but, as Christopher North has said, "We love all kinds of fishing, from the minnow to the whale." We remember, too, Burton's saying—"If so be the angler catch no fish, yet hath he a wholesome walk to the brook and pleasant shade by the sweet silver streams,"—where, amid their chosen haunts, he sees the finny tribes leading, as Leigh Hunt has sung,

> "A cold, sweet, silver life, wrapped in round waves,
> Quickened with touches of transporting fear."

Being benevolently desirous that the poor should have fish to eat—that the scientific should have fish to observe—and that the angler should have fish to catch—we hope our readers will pardon us for having detained them so long contemplating the ways and doings of men and fishes in fulfilling their respective lot—to eat and to be eaten.

We have a concluding request to make to those practically interested in the artificial rearing of fish. We desiderate from them such statistics as we possess regarding Stormontfield salmon, and

the sea-trout of the Nith. Pisciculture has been introduced in various localities in Scotland. What has been the result? what the cost? Have the puzzling anomalies exhibited by the Stormontfield fry been witnessed elsewhere? We observe that an angling club in the west of Scotland has introduced the grayling from England. We should like to know about the introduction among us of any new species of fish, and earnestly commend this hitherto neglected field of enterprise to the attention of all desirous to cater for the public stomach, in the well-founded expectation of thereby replenishing their own purses. To all such we emphatically declare that fish-rearing, if followed out extensively, will infallibly *Pay*. E.

PATENT SPECIFICATIONS RELATING TO MANURES.

In a former number of the Journal, while noticing the various patents which had been taken out in connection with reaping-machines, we took occasion to advert to the important practical purposes which "records" of the gradual progress of any department of art or science were calculated to subserve. Not only as yielding a large amount of interesting information to the purely scientific man, but as indicating to the inventor what has been by preceding inventors already done, those records are very valuable. To inventors, indeed—now that the cost of procuring a patent for the three kingdoms is so reduced as to place the privilege within the reach of the vast majority—such records of the steps taken in any branch of practical science are now more than ever indispensable. Our readers may perhaps be aware that, under the Patent Law Amendment Act of 1852, the specifications (and drawings, if any) of every patent, are published generally within six months after the date of passing the Great Seal. These specifications are sold at a very moderate rate, as a guide to those who wish to consult any particular specification. *Indexes to the patents* are published under the sanction of the Commissioners. From these indexes the object of the patent, with its date, number, and the price of the printed specification, may be ascertained, the latter being obtainable, through the medium of the post or otherwise, by application at the Office of the Great Seal, Southampton Buildings, Chancery Lane, London. Since the passing of the new law, the number of patents taken out have been so numerous that these [illegible] gradually attained voluminous dimensions, and are [illegible] as to be beyond the reach of a large number of [illegible] others to whom they have become indispensable. To [illegible] difficulty, short abstracts or abridgments of the specifications [illegible] under each head of invention, have been pre-

pared for publication separately, and so arranged as to form at once a chronological subject-matter reference, and alphabetical index to the class to which they relate. It is to one of these "Abridgments"* we are indebted for the basis of the following remarks.

For the purposes of easy reference, we propose to consider the patent specifications under two divisions, the "miscellaneous," and those relating to "town sewage, with the economisation of the excrement of our population." To the latter, as constituting at present a matter of more than ordinary interest, we shall probably devote the major portion of our allotted space.

Under the first head of "Miscellaneous Manures" may be classed those in which fish, lime, bones, coal-tar, salt, oils, and fatty matters, with peat and vegetable substances, form important constituents. So early as the year 1721 (Nov. 8, No. 438), a patent was taken out by John Piper and Matthew Tindall for a "certain compound never before made use of, consisting of prepared chalk and sea-water." Inventors then, as now apparently, were by no means backward in proclaiming the virtues of their plans, and of unhesitatingly avowing their belief in the complete success which would follow their adoption. Lack of faith and slowness of imagination have never been the characteristics of the class. Thus John Piper and Matthew Tindall assert that this same mixture of "prepared chalk and sea-water" "abundantly increaseth all manner of grain, pulse, and grass, *beyond whatever hath been known;*" and to prove which they proclaim themselves, in the petition for their patent, ready to produce the results of an experiment, in which one barley-corn, set with this manure, "produced eighty to one hundred and thirty large shoots, each having great ears of corne."

The petition of the patentee of the next manure, mentioned under date February 19, 1729 (No. 506), abounds in a variety of assertions as to its capabilities. The manure is capable, the patentee says, of "enriching and mending all sorts of land at one-third part of the expense less than in the common method of manuring land amounts to, not only from the cheapness, but also for goodness in causing the land to produce one-third in quantity more than any other manure." It preserves also, he goes on to state, the "wheat from smut;" it "kills the grubs;" and last, though not least, it is of that "richnesse in its nature as to preserve the land for three years without any other manure." What the nature of this valuable "compound" was we are unable to say, for further than thus whetting curiosity in the petition, the inventor proceeded not —a result all the more unexpected, when he tells us that its value had "been experienced by several *substantial farmers*"—a

* *Abridgments of the Specifications relating to Manure*, price 6d. Published at the Great Seal Patent Office, Southampton Buildings, Chancery Lane, London.

phrase, by the way, which is now quite a stereotyped one—who were "resolved to dress all their land therewith," and who had, in consequence, "bespoke large quantities for that purpose." Curiously enough, the inventor, in addition to vaunting its usefulness to farmers, states complacently that it will "also greatly augment our revenue," inasmuch as some of the ingredients used in compounding it "pays so great a duty, that for every 8 bushels of the said compound which is used in dressing an acre of land, the duty will amount to seven shillings at least." No great recommendation, we should think, to "substantial farmers," unless patriotic outweighed commercial considerations—a by no means likely occurrence.

Baron Von Christen Wilhelm Haake (patent under date July 30, 1773, No. 1049) trusts to the *magnetic* influence of his manure. This was composed chiefly of common salt, melted by heat till it is dissolved as thin as water. This is fixed with saltpetre ("which receives from the air a magnetic power, and communicates the same to the fluid"), salt of unslacked lime, and salts of Rhenish tartar; "when the said composition," says the Baron (so invented, found out, and prepared), "becomes of a magnetic quality, whereby it attracts its fertility, and is (as aforesaid) productive of the effect of manuring arable land, meadow, and pasture ground." This is all the baron says, and although not much in one sense, it is bold and uncompromising in tone; but whether the manure so described owes or owed its value to the nature of its constituents, or to the magnetic influence evolved by their mixture, we leave our readers to decide.

Between 1773 and 1841, few, very few patents were taken out, and those not worthy, we deem, of special notice here. In the latter year (September 4, 1841, No. 9060), another foreigner, rejoicing in as sounding and lengthened a name as our last-mentioned baron, namely, the Count de Theophil Anton Wilhelm Hompesch, took out a patent for certain processes connected with the obtaining of oil from schist, clay-slate, and asphalt, or other minerals containing bitumen or bituminous substances. The carbonaceous residue of which processes, ground into powder and heated with acid, has a great affinity for ammoniacal matter, and the gases from putrid matter, mixed with animal or putrid matter. The count states that "it forms a most powerful manure without any smell."

The name of the next patentee is that of a gentleman well known to all scientific agriculturists for his researches into the constituents and action of manures—John Bennet Lawes. In his [illegible] under [illegible] May 23 (No. 9353), he makes three claims—1 [illegible] decomposing "bones, bone-ash, bone-dust, apatite, or [illegible] other phosphoritic substances," by means of sul[illegible] 2 [illegible] Combining potash, soda, or magnesia, with

phosphoric acid, to be employed in soil deficient in alkalies;" (3) "Making use of a manure with silica combined with potash or soda, or composed of crystal or glass ground to a state of powder, to soil intended to raise wheat or any other plant of which silica forms an essential component. In this patent, however, Mr Lawes disclaims bones, bone-ash, and all phosphates except those derived from mineral sources, and also the third part of the invention.

In the patent of Oglethorpe Wakelin Barrat (under date February 10, 1845), we meet the first notice of a method of treating the waste lime of gas-works to produce a manure. In this method the acid gases are passed through the purifier, whereby the volatile combinations of ammonia are fixed.

Christopher Binks, a gentleman well known in the scientific world for his chemical researches, in the patent No. 10,604, dated April 7, 1844, claims " certain substances or compounds, of which cyanogen forms the principal or most important ingredient; also all those compounds which are artificially formed by the combination of cyanogen with other substances; that is to say, all those cyanogen compounds in which the cyanogen is of a nature calculated to subserve, develop, or give effect to the property of promoting vegetation possessed by the cyanogen itself, and whether such artificial cyanogen compounds are so applied and used by themselves or along with any other manure or manures.

The next manure we have to notice is that of the celebrated Liebig, by which the constituents taken "away by the crop which has been grown on and removed from the land were proposed to be restored to it in such a manner that the character of the alkaline matter used may be changed, and the same rendered less soluble, so that the otherwise soluble alkaline parts of the manure may not be washed away from the other ingredients by the rain falling on the land, and thus separating the same therefrom." This manure was made by " fusing in a reverberatory furnace substances containing the elements of the ashes of the plants to be grown, grinding them up, and occasionally mixing them with gypsum, calcined bones, silicate of potash, phosphate of magnesia, ammonia, and common salt. The date of the patent is April 15, 1845, No. 10,616.

In the patent of Alexander Angus Croll, well known for his improvements in gas mechanism, a manure is described as composed of lime and coal-tar in certain proportions. "To prevent ignition of the tar, and the consequent loss of ammonia contained in it, it is necessary to cover it up with any refuse matter (as common mould), when the mass acquires a temperature of 400°."

The patent of Augustin Julien Van Oost (under date October 6, 1845, No. 10,853) is somewhat of a curiosity in its way, from the method of applying the manure. This is not to be placed in the

ground along with the seed, both being separate from each oth but the corn and other seed is to be previously prepared by app ing a "*coating* of sulpho-azoted principles and of gelatine, whi being absorbed by the young plant, or acting as a ferment, aid vegetation in a considerable degree." A great variety of su stances may be used for this coating.

The patent of Thomas Gill and John Edgcombe Gill (un date April 8, 1848, No. 12,113) relates to the manufacture superphosphate of lime from bones by the employment of acid a artificial heat, and the employment of muriatic, nitric, and ac acids for the same purpose.

The first patent connected with the preparation of peat as a odoriser and manure is that of Jasper Wheeler Rogers (un date June 1, 1848, No. 12,169). The second part of the inv tion refers to the "manufacture from peat of granulated ch coal, and to the admixture thereof with animal excrement for purpose of deodorising the same, and making a diluted inodor manure."

The preparation of manure from fish has of late attracted c siderable attention: the first patent connected with this dep ment is that of John Bethell (under date August 21, 1848, 12,250). The processes mentioned in the patent refer to the p serving of "all kinds of fish, whale-blubber, seals, &c. &c., or refuse of herrings, and of whales and seals, after the oil is extrac therefrom, by steeping them in open tanks with antiseptics; great number of which are enumerated in the patent. "When u by the farmers, the animal matter is cut or ground into very sm pieces, and mixed with earth, ashes, or lime, and applied in same manner as guano is now used."

John Marriott Blashfield (patent dated September 27, 1849, 12,790) proposes manure from *mud* deposited by rivers and ot waters, subjecting the same to the action of heat, treating it w acids, nitric or sulphuric, and mixing with it other fertilising m ters, as gypsum, sulphate of soda, &c. &c. &c.

The "superphosphate of lime" patented by John Dobell T kett (under date October 18, 1849, No. 12,819), is prepared taking animal substances containing phosphate of lime, and s mitting them to a high pressure with water "in a steam dige or digesters until the gelatine is dissolved, and the bones or ot substances have become friable; . . . the bones or other substan which remain are to be crushed to a still finer powder."

John Gedge (patent dated December 17, 1851, No. 13,8 ... to treat "stable litter or dung by means of a solution ... certain chemical salts, by sprinkling the litter while i ... able ... afterwards making a dunghill outside of al ... th... dung and straw broom, leaves of tree ... his arrangement "fermentati

says the patentee, "rapidly takes place, and the ammonia is preserved," as the combination obtained may be used either alone or mixed with earth or other pulverised substances."

Slag, or scoriæ from iron blast-furnaces, is proposed by Alexander Cuninghame (patent dated March 8, 1852, No. 14,013) to be treated so as to leave, by one method, a residuum of hydrate of silica and gypsum, valuable as a fertiliser of land;" and by another method, silica "most valuable as a manure." We know of one instance, we may remark *en passant*, where scoriæ or slag, reduced to powder and applied to land in East Lothian, gave very unsatisfactory results.

In the patent granted to Richard Archibald Brooman (under date August 10, 1852, No. 14,255), "a fish guano" is described as made by disintegrating "fish," or the "remains of fish," by boiling or steaming, afterwards forming or drying them. This fish-guano may be mixed with the bones and skeletons of fishes and marine animals, these being first crushed and steamed at a pressure of four or five atmospheres. This softens them, and removes all the "fat and grease so prejudical to vegetation."

In the patent of Edwin Pettitt (under date October 1, 1852, No. 84), ammoniacal salts "are produced from soft nitrogenous solids, or fish, or the flesh of land animals, by treating them with sulphuric or hydrochloric acid."

A mixture of charcoal, either animal, vegetable, or mineral, with a variety of chemical compounds, as chloride of calcium, common salt, &c., is used by William Chisholm (patent dated October 14, 1852, No. 382) to purify gas. After it has performed this office, it has, says the patentee, "attained a value as a rich manure."

Blood in its natural state is treated by James Otams (patent dated October 19, 1852, No. 448) with sulphuric or other acid, the product being combined with phosphates, which act as dryers.

George Elliot (patent dated March 4, 1853, No. 546) combines "oily fish," and also refuse animal matter, as butchers' offal, with alkaline or earthy matter, forming a "species of alkaline or earthy soap, which is the material that may be used in any convenient form for manuring purposes."

The "patent wool manure" (patentee, Thomas Rhodes—date of patent, March 12, 1853, No. 629) is prepared by reducing wool or hair into a finely-divided condition or pulp by machinery, then dissolving or treating the same by acid or alkali. The pulp may likewise be mixed with sulphuric acid, and combined with ground bones, phosphorite, coprolite, burnt bones, or animal charcoal. The *wool manure* of Edward Thornhill Simpson (patent dated May 18, 1853, No. 1230) is prepared by subjecting wool or hair to steam heat and the action of sulphuric acid, combining the solution with bones, &c. Robert Oxland (patent dated September 1, 1853, No. 2027) also prepares wool manure by the aid

of superheated steam, or heated atmospheric air and sulphuric acid, or by calcining the wool, shoddy, &c. in an iron retort heated to about 300° Fahr., and afterwards grinding the product to powder.

Charles Frederick Spicker (July 25, 1853, No. 1750) generates and fixes ammonia by decomposing water, and liberating its hydrogen. This mixing with the nitrogen of the atmosphere forms ammonia. For this purpose, iron in thin scraps is mixed with clayey earth, "saturated with dilute acid, and exposed to the air. On drying, the clay is found to contain salts of ammonia, which are increased by repeatedly moistening and drying the mass. Salts of the protoxide of iron and manganese may be employed with humic acid instead of iron and sulphuric acid, and finely-ground coral or coralline, or oyster-shells of a similar kind, either in their fresh state, or when they are found, as in fossil shells, in mineral deposits, may be added to the mixture." This greatly increases the amount of ammonia.

William Longmaid (patent dated August 11, 1853) decomposes "sea-weed, peat, and other vegetable substances," by immersing them in solutions of potash, soda, and lime—draining them from the lye, drying, and reducing them to powder.

In our article on "The Steam Engine applied to Agriculture," we alluded to the suggestion of Professor Playfair for the economisation of the products of coke distillation, by which ammonia, useful for agricultural purposes, might be obtained. In the patent granted February 23, 1854 (No. 438), to William Hunt, a method is described for thus "utilising ammonia." The complete specification relates only to "the recovery of ammonia" and muriate of ammonia, which is volatilised "from the dipping-trough during the process of galvanising iron." But in the provisional specification the inventor proposes to add "salt or brine with the coal used in retorts or coke ovens. As the coal becomes heated, the salt is decomposed, and muriatic acid goes off, which combines readily with the ammonia, and condenses readily in the hydraulic main as muriate of ammonia." In the complete specification, the vapours from the galvanising process are described as being made to pass along a flue filled with coke, and kept moistened with dilute muriatic acid. *Sulphuric acid is used to recover ammonia for agricultural purposes.* Gorse or brushwood may be used through which [illegible] vapours, this being used without liquid. The muriate [illegible] collects in the gorse, and may be shaken off as desired. [illegible] ammonia may be thrown forward into a coke-con[illegible] moistened as before.

[illegible] glanced at a variety of patents, under which a [illegible] substances are proposed to be used. We have [illegible] present division of our

paper, which proposes to make even the smoke which passes from our steam-engine chimneys tributary to the art and craft of manure-making. The patent granted to Auguste Edouard Loradoux Bellford (a communication from Professor Frederick Kuhlmann, dated July 18, 1855, No. 1628) proposes to condense vapour and smoke. The smoke is to be condensed by means of agitators, or by a "shaft armed all over with brushes or bundles of horse-hair, whalebone, or other suitable material." Motion is given to this by means of a leathern strap, so that a small quantity of what the inventor terms "condensing liquid" may be raised, and cause the "ammoniacal liquor to pass through a regular condensing shower." The condensing liquids "may be dilute sulphuric or muriatic acid, or rather muriate of manganese, a residue pernicious in works. From this working will result sulphate or muriate of ammonia, and carbonaceous residues, pure or mixed, with oxide and sulphuret of manganese, which, with the addition of ammoniacal salts, will produce a very efficient manure."

We have just further space to notice a patent manure (patent granted to Richard Pannell Furlong, October 31, 1855, No. 2431), which "shall not only be capable of fertilising the land, but also of protecting the end-shoot or young plant from the turnip-fly and other vermin." The manure is made by mixing in certain proportions bone-dust and powdered sulphur, and "subjecting them by preference to a furnace just sufficient to cause a thorough combination of the materials. On cooling, the compound is powdered, and, thus produced, will be found too rich. To dilute it, it is mixed with some comparatively inert substance, and by preference gypsum is employed."

We now come to the second division of our paper, the patents relating to "town sewage," and its economisation and preparation as a "manure." Although "town sewage," in its normal or ordinary condition in towns of large population, is made up of a vast variety of constituents, still those of chief value are the solid and liquid animal excretæ. The value of these for manuring purposes has long been known, both here and in other countries. The Chinese—whom Sir H. Davy considered to have a more intimate knowledge of manures than any other people—have long been in the habit of saving with great care the excretæ of the population, mixing them with fat marl, and after forming the mixture into cakes, drying them in the sun. These cakes are a "common article of commerce," and have "no disagreeable smell." The first patent recorded having reference to "town sewage," describes a method of treating it somewhat after the Chinese method above described. The name of the patentee is Lewis James Armand Estienne (patent dated January 9, 1812, No. 2570), and the object of the invention is to convert "human excrement into a powder divested of all smell, preserving at the same time its ferti-

lising properties." This is effected by gathering the matter into tanks, so constructed as to allow the liquid to be drawn off. The solid matter left is then dried in the sun, either mixed or unmixed with lime. Heaps of it are then to be stowed in a shed, which causes the mass to be heated to a temperature of 212° Fahr. The final process is crushing the material, so as to enable it to lie in a very small compass.

The patent granted (July 17, 1835, No. 6865) to Joseph Henri Jerome Pottevin was the precursor of numerous plans in which carbonaceous matters are used to deprive town sewage of smell. M. Pottevin obtained a deodorising powder by calcining mud or earth, having added these to animal or vegetable matters, capable of producing carbon by calcination.

The patent already noticed, in the first division of our paper, as granted to Count Hompesch (No. 9060), may more properly come within the present division, as the carbonaceous residues obtained from his process of rectifying oil were proposed as a deodorising powder for putrid or animal matter.

The patent granted to Albert Dominick Frick (August 10, 1842, No. 9442) describes substances the refuse of nearly every manufacture, which he proposes to mix with animal excretæ and charcoal, for the purposes of manuring.

Some of the products of distillation of bituminous substances were proposed to be mixed with the residual ash of the retort, by Michel Antoine Bertin Beerin du Buisson. In his patent, granted June 23, 1845, he states that the power of the manure so obtained is increased considerably in azote by allowing it to "absorb fresh or coagulated blood, or any other soft animal matter, as nightsoil, or brains, or liquid such as urine."

John Evans, in his patent (dated August 7, 1845, No. 10,806), describes a manure which is made by treating almost every variety of trade-refuse or animal excretæ, with different chemical agents, such as "the decoction of oak, pyroligneous acid," &c. &c.

In his patent (dated April 28, 1846, No. 11,181), William Higgs proposes to collect sewage water in tanks, solidifying and drying the solid matters therein contained; also, over such tanks to erect buildings, in which the volatile gases rising from the sewage may be condensed, and in which the salts formed by their combination with chemical agents may rest and be crystallised. To precipitate the solid matter, the patentee prefers "hydrate of lime, commonly termed slacked lime;" and to condense the gases from the collected sewage below, "chlorine gas" is preferred, although "hydrochloric gas, and some other chemical agents, may perhaps be cap[illegible] effecting the same."

[illegible] proposes in his patent, dated February 20, 1847 [illegible] "disin[illegible]" fecal substances by means of the [illegible] salt, coal-tar, &c. &c.; also to convert

the fecal substances into manure, by mixing them with a powder obtained by "incinerating," in closed vessels, the following substances in certain proportions: "coal or wood ashes and earth, or street or road sweepings, and vegetable, animal, or mineral rubbish, such as sawdust, bone-dust, and the waste waters of tanneries, cotton-mills, &c."

The patent peat-charcoal of J. W. Rogers (No. 12,109), already described, is also applicable as a deodoriser. It is to be added in such quantities as will be sufficient to absorb the aqueous and volatile products of the excrement, and destroy the effluvium.

As a deodoriser for nightsoil, Henry James Tarling proposes in his patent, dated March 7, 1856 (No. 12,992), to use highly carbonised refuse tar.

Paul D'Angely, in his patent, dated June 4, 1850 (No. 13,097), proposes to deodorise every species of excreta by a "fluid composed of fresh bark, rue or wild mint, sulphate of iron, and pyrolignite of iron." The fecal matter is converted into manure, by being dried in a chamber, and reduced to powder, and finally mixed with dried or burnt peat in powder, or with dried beasts' blood.

The disinfecting agents employed by James Hamilton Brown (patent dated October 10, 1850, No. 13,280), are salts which do not contain an excess of acid, but, on the contrary, are basic, such as sub-sulphate of the peroxide of iron. A solid disinfecting agent, or one in a state of paste, may be made by mixing some metallic salts with some cheap oleaginous matter.

February 24, 1851 (No. 13,526) is the date of the patent granted to Thomas Wickstead, the well-known engineer, and the working out of which at Leicester and Croydon has attracted so much attention of late amongst scientific and practical men. The object of the patent is to manufacture "manure from sewage water," by mixing it with milk of lime, collecting the deposit, and submitting it to certain centrifugal drying-machines. By this means "the whole, or nearly the whole, of the moisture is driven off, and the manure or fertilising matter is obtained in a state commodious for transport." We may here state that a sample of the manure obtained by this process, analysed by Professor Way, was "found to contain only 2.73 per cent phosphoric acid, and nitrogen equivalent to 3.94 per cent of ammonia."

In his patent, dated October 16, 1851 (No. 13,775), Mr Richard Dover proposes to treat sewage water with acid, as hydrochloric or other mineral acid, thereafter filtering it through charcoal, gypsum, peat, &c. Of this, and all other patents which propose to treat the sewage water with acids before filtration, Mr Dugald Campbell, F.C.S., says, "If little valuable matter for agricultural purposes is retained by the charcoal from filtering ordinary sewage through it, still less must result from sewage water to which acid

has been added, by reason of the acid rendering soluble any ubble phosphate which might be in the fecal matter."

On March 11, 1853, John Thornton Herapath, the well-k chemist, patented (No. 643) a method by which the phosp acid and ammonia were "precipitated in a comparatively ins state by the addition of magnesia, or a magnesian compou or about the same time as the deodorisation of the said sewa effected by the addition of some chemical agent, which wi decompose ammonia or its salts, but will combine with, or al hydrosulphuric acid, such as metallic sulphates, or m chlorides, or animal or vegetable carbon."

James Alexander Manning, in his patent dated Novembe 1853 (No. 2780), proposed to defecate and separate certain ters from sewage, by employing the following chemical ag "Animal charcoal, alum, and carbonate of soda and gypsu certain proportions, and making a manure by mixing wit sewage, precipitated in this manner, waste charcoal, or car ceous matter of various kinds, kelp, factory waste, commo or refuse brine derived from the curing of provisions gypsum, or phosphate of lime, and bone-dust riddlings." In (March 27, No. 709), Mr Manning took out a second pate which he proposed to use, instead of alum—which we belie experiments with his first patent showed to be too expens "alum" or "soft sludge" from the alum-works. This deposit during the boiling-down of the rough liquors obtainec alum shales in the manufacture of alum, and which deposi sists essentially of basic, and other sulphates of iron and alu The "soft sludge" being added to the sewage, the contents reservoir are agitated, and, whilst agitation is going on, pow caustic or unslacked lime and animal charcoal are thrown ir 1855 (August 7, No. 1786), Mr Manning took out a third "for the application and use of alum slate, alum shale, alum alum stone, alum ore, and other aluminous minerals and ear a precipitating and clarifying agent for cleansing sewage w In addition to this alum liquor, powdered lime, with animal coal, are employed. Mr D. Campbell, in his recent paper "Application of Sewage to Agriculture," read before the Ch Society, says: "Mr Manning suggests two circular tanks, used alternately, and capable of holding 100,000 gallons along with this quantity of sewage water is put 800 lb. of ...udge,' some cream of lime, and 'waste animal charcoal ...hole agitated for about five minutes, and allowed to subside, ...e water is run off. Mr Manning says the subsidence of th ...pitate is so rapid that the mixing and precipitating will ...complished in the time it would take to fill the second The same materials are said to serve for three more oper [illegible] Mr Manning, we unde

has carried on several experiments on a large scale in connection with the sewage of Edinburgh and Glasgow. Mr Campbell, in the paper already referred to, has given two analyses, by Dr Penny of Glasgow, of manures obtained by this process, and which we here take the liberty to insert:—

	No. 1.	No. 2.
Organic matter,	37.45	50.00
Phosphates,	...	10.14
Phosphate of lime,	2.05	...
Chlorides and phosphates,	22.89	...
Carbonate of lime,	1.77	1.75
Sulphate of lime,	...	9.46
Silica,	19.73	23.98
Alumina,	...	...
Omitted in analysis,	...	4.67
	100.00	100.00
Ammonia,	1.50	2.95

"If we take into consideration," says Mr Campbell, in remarking on these analyses, "this water (the uncombined water or moisture in all artificial manures), the first material does not appear to be very distinct from the results with lime upon sewage water. The second material, however, is considerably different. An extraordinary addition in working the process of "waste animal charcoal," as Mr Manning terms it, but which is a substance of high money value in the market, might account for the very great increase of sulphates over the first, but the increase of ammonia I cannot account for in any way. In the event of the alum sludge becoming a scarce commodity, Mr Manning proposes to manufacture it, and thinks he can do so at a cost of five shillings per ton, exclusive of carriage."

Returning to our chronological arrangement of patents, we have now to notice that granted to Robert Angus Smith and Alexander M'Dougall of Manchester, for improvements in "treating, deodorising, and disinfecting sewage and other offensive matter, which said improvements are also applicable to disinfecting in general." The process consists in employing alone or together a combination of magnesia and lime with sulphureous acid and carbonic acid, either in an acid or alkaline state. The complete specification states the object of the patent to be "the removal of all smells from sewage and other offensive matter, and the separation or preservation of such parts of the same as are useful for manure." The process has been carried out on a large scale at Manchester, and has, we believe, been very successful.

On 20th January 1854 (Nos. 192 to 194 inclusive), three patents were granted to Thomas Wickstead, to whose former patent we have already alluded. The first patent refers to the moulding of the solid precipitate of sewage into blocks perforated with holes, which greatly facilitates the drying. The second patent

refers to a plan of precipitating the fertilising matter from sewage by mixing it with lime and finely-divided charcoal; the mixing is performed by two pumps—one of which pumps the mixture, the other the sewage water. The third patent refers to the construction of reservoirs, arranged so as to cause the flow of equal quantities of water from all parts of the end of the reservoir (except a portion at the bottom which serves for the accumulation of the precipitate), by which means a slow current is produced in the whole of the transverse section of the water which lies above the precipitate. The water is thrown off by means of an endless screw and Jacob's ladder, in such a manner as not to place the precipitate in contact with the supernatent liquid.

The patent granted to the well-known chemist, John Thornton Herapath (dated March 17, 1854, No. 638), refers to the employment of the coke of the "so-called Boghead coal, or Torbanehill mineral, either before or after the aluminous ingredients of the coke shall have been extracted by an acid or other chemical, for the drying, deodorising, or absorbing of sewage, or other matters operated upon."

William White, in his patent (dated October 12, 1854, No. 2181), proposes to carbonise nightsoil, or other animal refuse, or fish, in a close retort, introducing, while the matter therein is in a state of incandescence, a quantity of impure carbonate of potash or soda. The mouth of the retort is then to be closed up, and the whole to be exposed to a full red heat for about an hour. A portion of the nitrogen of the atmosphere which finds its way into the retort combines with a portion of the carbonised matter, and forms cyanogen, which combines with the base of the alkali employed. The distillate is then passed into a condenser charged with a strong solution of common salt, or dilute mineral acid. The distillate is added to the cyanic compound in the retort, and blood desiccated by sulphate of ammonia. According to the purposes for which the manure is required, other substances are mixed with this compound, as dried nightsoil, wood-ashes, &c. "Disease, attacks of insects, or fungi on plants, are to be prevented by a mixture of the following ingredients; namely, hydrate of lime, sulphate of alumina, sulphate of protoxide of iron, sulphate of magnesia, charcoal prepared as above, bi-phosphate of lime, and chloride of sodium, together with the condensed volatile matters. "This is [illegible] the plant-preservative."

Thomas Littleton (patent dated December 1, 1854, No. 2532) [illegible] to separate the gases from sewage water by means of a vacuum, [illegible] being absorbed by charcoal or other matter, and the result [illegible] manure. The patent granted to George [illegible] dated December 23, 1854, No. 2715) has the same [illegible], the noxious vapours being forced, by means of a [illegible] into combination with deodorising materials.

In glancing as we have done at the leading patents granted for manures, we cannot fail to be struck with the remarkable similarity which exists between many of them. In some cases identical processes have been patented at different times, and by different individuals. This could not have happened had inventors had an opportunity of ascertaining what had already been proposed by others who preceded them. This opportunity is now afforded them by the publication of the Patent Commissioners, which has formed the basis of our present paper. It abounds with matter curious and interesting to the agricultural reader, and of special importance to those who contemplate adding to the already extended list of artificial manures.

THE DISTILLATION OF BEET-ROOT, AND THE APPLICATION OF ITS RESIDUES TO CATTLE-FEEDING PURPOSES.

By ROBERT SCOTT BURN.

Author of the "Handbook of the Mechanical Arts," &c.

IN an article on beet-root cultivation which we presented to our readers some years ago, we quoted the remark of an able authority, to the effect that "it completely revolutionises agriculture; for its existence in a district is perfectly incompatible with imperfect tillage." Through beet-root cultivation "people learn the value of manures, the science of capital applied to agriculture." Since the date of the article above alluded to, the cultivation of this crop has greatly increased on the Continent, where it has for a long time been a favourite; and has yielded still more decided evidence of its agricultural value. For many years the root was chiefly used for the manufacture of sugar; but of late another and a more important process for which it is available, has been rapidly extending in favour. We allude to the distillation of spirits, and the application of the residue of the process to the feeding of cattle. Statistics, carefully got up, have proved that in France, where these two great processes—the manufacture of sugar and the distillation of spirits—are carried out, the cultivation of sugar-beet has doubled the amount of corn grown. The society of Valenciennes, in their report in 1850, attributes all the progress in agriculture, since 1832, to the cultivation of beet. Before that year the produce of wheat was 250,000 hectolitres; this, since the establishment of sugar-works and distilleries, has nearly doubled (420,000 hectolitres).* The average for the whole

* The hectolitre equals 2.75, or two and three-quarters of a bushel.

district before 1832 was 8 hectolitres per acre; it is now 12. The district of St Quentin affords results still more significant. About 1825, 67,755 acres comprised the extent of land devoted to corn; in 1855 this was increased to 84,772; the increase of the wheat during the above period being nearly doubled, the produce of barley, oats, and rye, being considerably decreased. In 1825 the average crop of wheat per acre was 5¼ hectolitres; in 1852 it was 8 hectolitres per acre; beet-root at this latter date having been cultivated to a great extent, yielding produce for twenty-five sugar-manufactories and distilleries. The influence upon stock of beet-root cultivation is as striking and suggestive as it is upon the white crops. The residue of the sugar manufacture, as shown in our article formerly alluded to, affords a feeding pulp of considerable value. The residue of the beet distillation is, however, still more remarkable for its feeding properties; in addition to its superior feeding qualities, it is capable moreover of being kept for years without deterioration. In the district of Valenciennes in 1822 scarcely 4000 oxen were fed; in 1851 this number had increased to 10,784. In St Quentin the number of cattle fed at the date of erection of the first sugar-factory (1828) was 10,000, and of sheep 70,000. In 1852 the beet-root residue enabled 16,909 head of cattle, and 149,491 head of sheep, to be fed.

We have in our former article traced the causes which led to the establishment of the manufacture of sugar from beet on the Continent, and its gradual progress from the time when it was fostered by Napoleon, till it assumed features of high commercial importance. The history of the process of distillation from beet does not, however, present such generally interesting features, although so early as 1812 the Count Chapent set forth its advantages, and M. Dubrunfant in 1821 seriously urged farmers and distillers to engage in it. Distillation from beet was not attempted to be carried out in France on a great scale till 1852, the main exciting cause being the failure of the vine-crop distillation; the production of the district of Languedoc, for instance, falling from 30,000 to 100,000 pipes of alcohol, 60 over-proof, to 30,000 only. The development of this new manufacture has been, however, remarkably rapid; in 1852-3, the value of beet alcohol in France was only £20,000; in 1853-4 it had increased to £1,230,000, and in 1854-5, to £2,000,000. So important, indeed, is the new process considered in its relation to agriculture, that in a report recently presented to *La Société Imperiale et Centrale d'Agriculture* by several men of eminence—amongst whom we may notice Boussingault, so honoured and esteemed for his chemical researches—distillation from beet is recommended "as a part of the rural economy of France because it inc[illegible] manure, increases meat, and increases [illegible] distillation on farms," says the report [illegible] ject. is a recent fact. Excep

tionally, the departments of the East, the neighbours of Germany, have instructed the people on the other side of the Rhine, and all the north of Europe, in establishing the distillation of spirits as the basis of their rural industry. We are only beginning to comprehend the true end of the distillation of beet-roots. The production of spirits ought to be regarded as a subsidiary object; the essential aim and end of the distillation is, to produce more abundantly, and at the same time more economically, meat and corn. The distillation of roots, we must repeat, in order to keep the true object of this industry in view, is a means of solving the chiefest problem, that in which art and science blend all their efforts — the production of manures. It helps the solution by enabling animals — our machines for supplying manure — to give it for nothing, which is a great progress; to give it with profit, and with even increasing profit, which is perfection." To note, then, the process which promises so much, and which it is justice to say has performed so much—to describe its peculiarities, and the claims which it presents to the notice of agriculturists in this country, cannot fail to be interesting and useful to the readers of this Journal. We propose, therefore, to devote to this purpose a few of the following pages, selecting for description the process introduced by M. Leplay.

There have been several systems of distillation introduced in France, none of which we believe have been so successful in an agricultural point of view as that of M. Leplay. By M. Leplay's method, the alcohol results from the decomposition of the saccharine matter contained in the roots prepared in a peculiar manner, all the nutritive qualities being left in the roots; the residues as a feeding material, are also well cooked, possess a slight acidity, and are capable of being kept for such a length of time that they may be used all the year round. In the other methods there is either a difficulty in keeping the residues for any length of time, or they are found by the peculiarities of the process to possess little value as a feeding material. M. Leplay's method of distillation is now being introduced into this country through the auspices of the well-known and enterprising firm of Messrs William Dray and Co., agricultural engineers, Swan Lane, London, and who have already, during the course of a few months, been instrumental in establishing eleven large distilleries in various parts of England. A member of the firm, Mr William Dray, at his farm at Farningham, Surrey, has an apparatus which is now operating on twenty tons of roots *per diem*. We inspected this apparatus while at work some months ago, and, from the simplicity of the arrangements, felt satisfied that no difficulty would be found in carrying on the process in farms where the assistants are of the ordinary character, and the farmer possessed of a little *nous* in mechanical arrangement and superintendence. Certainly neither

in the complexity of the apparatus, nor in that of the manipulation or preparatory processes, is there anything to deter an intelligent farmer from carrying out the system—on the contrary, in view no less of the commercial value of the spirit obtained, than of that of the residue as a material which will be available at any period of the year, and which is unquestionably, as we shall hereafter show, of high feeding value—there is much to induce him to adopt it. Since our inspection of the apparatus at Mr Dray's farm, considerable modifications of arrangement in the mechanism employed have been effected, tending to simplify the process of distillation. With these and other points of interest, also since that time developed, we have, through the kindness of the gentleman who superintends the apparatus—a well-known Continental agriculturist and engineer—been made acquainted, and we shall in due time present them to our readers.

In preparing the roots for the distillation, the first process to which they are subjected is that of washing. This is effected in a rotatory root-washing machine, driven by the steam-engine which works the apparatus, and the boiler of which also provides the steam by which the distillation is effected. The roots are passed in at one end of the machine, soiled as they come from the field, and are delivered from the other well washed, and cleaned from all adhering matter. They are then passed through a turnip-slicing machine—that of Messrs Barnard and Bishop being employed at Mr Dray's farm—which cuts the roots into slices. The form of slice best adapted for the after processes through which it has to go is found to be that of a narrow slip 1 to 1½ inches in breadth, with a thickness of ⅛ to ¼ inch. This peculiar form is required so as to allow of the slices to lie in the distilling cylinders in such a way as to form interstices through which the steam can pass. Too much care cannot be given to the preparation of the slices, to prevent them being made too small and thin on the one hand, which will prevent the *distillation* being carried out completely and effectively; or too large and thick, on the other, which which will cause the *fermentation*—a process preparatory to that of distillation—to operate slowly, and penetrate with difficulty to the centre of the slice. The shape and size indicated above is the one which has given the best results.

The *fermentation* of the roots so washed and sliced is the next process, and is one which requires to be executed with great care. It is the method adopted by M. Leplay at this part of the process which constitutes the peculiarities of his system, and is that which distinguishes it from that of other inventors. The fermentation is carried on in large vats capable of holding some 300 gallons of liquid and about 15 cwt. of sliced beet. Covers are provided to [illegible] perforated with holes to allow of the escape of

the gas evolved during fermentation; the covers are kept down by means of bars while the process is going on.

The principle on which the fermentation is carried on is founded on the following facts: That the saccharine roots, beets, carrots, &c., if cut into pieces, and placed in a fermented liquid formed of their own juices, and completely covered therewith, and thereafter be treated with a proper quantity of sulphuric or any other powerful acid, will "undergo a perfect alcoholic fermentation; after which the alcohol is found in the cellular tissues of the vegetable fermented, having thus taken the place of saccharine matter." By fermenting the beet in a liquid or juice saturated with its own elements, its azotic and nutritive are left in it, the saccharine matter only being changed into alcohol. The roots thus fermented being subjected to the action of steam in properly-arranged vessels, the alcohol is released, and, escaping as vapour into a condenser, is converted into a spirit, varying in strength according to circumstances.

In commencing to distil, then, the first operation is to prepare the fermenting liquid, "vinasse," or "little wine," as it is termed. This, in the first instance, is prepared by macerating slices of fresh beet in a vat with water, raised to a temperature of 145° Fahr.; or with water acidulated with sulphuric, chlorohydric, nitric, or other acid. When the liquid thus obtained becomes fully saturated, that is, contains as much alcohol as the roots put amongst it, it is ready for the after processes of distillation. To saturate the liquid, or, in other words, to prepare the vinasse, takes about a fortnight; a succession of fillings and emptyings of the tank being gone through during that time. It is evident, therefore, that until the vinasse is of the proper strength, the first distillations will produce alcohol of little strength. This, however, in the average of working is no loss, inasmuch as the vinasse, after the working season is over, when the supply of fresh beet is no longer maintained, is passed through the still, and produces alcohol of the average strength. Each filling, parting with less of its alcohol to the liquid, produces in distillation stronger alcohol, until the liquid, being saturated, derives no further supply from the beets, but these are passed to the distilling cylinders in a condition capable of yielding their full average amount of alcohol. The vinasse being thus obtained, the process goes on as follows: As the slices of beet are filled into the fermenting tanks, a certain quantity of sulphuric or other powerful acid is added. The quantity of this varies with circumstances, as the quality of beet, the soil on which it was grown, or the period of the year during which the distillation is carried on—an average quantity of acid per ton of beet may be stated at ½ a gallon, or 3½ pints. This should be divided into three equal portions, each portion being diluted with a little of the

"vinasse" or water—one-tenth of the acid to nine-tenths of vinasse or water. One portion of the mixture should be added to the tank, with one portion of the beet—the latter also being divided into three parts. When the tank is filled with its proper quantity of beet and liquid, the whole should be well mixed, and the temperature kept up by admitting steam to the interior of the tank to about 77° to 82° Fahr. The temperature should not exceed 82° 49′. While the temperature is rising, the whole mass should be well mixed, so as to insure a uniformity of heat. When this is obtained, the mixture is fermented by adding to it "five pounds of compressed beer-yeast, or four and a half quarts of liquid yeast, as obtained in the breweries." This should be mixed with a little of the liquid from the tank, until the mixture is homogeneous; it should then be added to the contents of the tank, and the whole well mixed with the rake. When thus filled, and the cover put on, the contents of the tank soon begin to ferment—the liquor bubbling through the apertures in the cover, and the carbonic acid gas escaping freely. Fermentation ceases according to circumstances in from ten to twenty-four hours; and on this taking place the contents diminish in volume. The succeeding fillings of the tanks are conducted precisely as above stated, with this exception, that the quantity of yeast should be only one-half for the second and third fillings of that used for the first, no yeast being supplied to any of those succeeding the third filling. By this fermenting process the "transformation of the saccharine matter is always regular, and the quantity of spirit obtained is proportionate to the quantity of sugar in the beet."

The beet being fermented, it is ready for the distillation process, which we shall now attempt to describe. The beet to be distilled is placed in tall cast-iron cylinders, five of which are placed around and have communication with a central rectifying column. The beet is not filled *en masse* into the cylinder, but is spread evenly in comparatively thin layers on a series of perforated plates or diaphragms, supported by a central bar standing vertically in the cylinder. Each diaphragm is provided with a central hollow boss, projecting some distance from its upper side; the central bar passes through the boss, and while one plate is filled with its layer of beet, and is lowered into its place in the cylinder, the next succeeding plate rests on the upper edge of the boss of the lower plate, thus leaving a space between the two plates. The number of plates varies with the size of the cylinder. On all the plates being put into the cylinder the cover is fitted tightly on, and this is provided with a safety-valve, through which the steam escapes when it exceeds a certain pressure. The cylinders being filled [illegible] steam from the boiler is admitted, according to a certain plan [illegible] between the cylinder and the refrigerator also being [illegible]

At the period of our visit in December last (1856), three cylinders were used, and the following is a description of the process of distillation then adopted: A steam pipe communicating from the upper part of cylinder No. 3 to the lower part of cylinder No. 1 is opened, steam at the same time being admitted from the boiler to the upper part of No. 1. In three-quarters of an hour after the steam is laid on to No. 1, the steam begins to enter the condenser. The spirit at this point is above proof, but as the process continues the strength is reduced below proof, which result is arrived at in three-quarters of an hour. While the distillation of No. 1 is going on, cylinder No. 2 is filled with the beet, and its cover put tightly on. As soon as the spirit from cylinder No. 1 runs twenty under proof, the communication between it and the condenser should be stopped; at the same time the communication between the top of No. 1 and the bottom of No. 2 must be opened. The cylinders 1 and 2 are now in communication; the steam from the top of No. 1 passing from the bottom of No. 2 through its layers of beet. At the expiration of 45 minutes the steam from the top of No. 2 passes off in the condenser—the spirit at first over proof as above stated. Since our visit a very important alteration in the method of charging and distilling has been made, which we shall now describe in the words of the talented engineer who has the conduct of the process in this country, and which he has kindly furnished us with during the last few days. In the new arrangement, 5 cylinders are used instead of 3; they all work into the bottom of a rectifying column, "so that the columns or cylinders of distillation being placed all in communication with the column, three at a time, at different periods of their distillation, give into the bottom of the rectifying column three different alcholic vapours having three different strengths. Thus No. 1, which begins, throws off vapour 30 over proof; in a quarter of an hour it is throwing off 10 under proof; but No. 2 is in communication, giving off 30 over, and No. 3 is to be added when No. 2 is got down to 10 under proof—No. 1 at this time giving 30 to 40 under. The result is, the mixed alcoholic vapours are, together, about 20 under proof, which is the best strength for rectification. Thus the spirit is never completely condensed till it is rectified; the new regulations of the Inland Revenue are complied with; and a continuous rectification is carried on, so that the spirits do not enter the receiver till they are fit for sale, that is, perfectly neutral."

Having thus brought up the process of beet-root distillation, from the cleaning of the root till its conversion into spirit, we propose to glance briefly at the commercial prospects of the process. "A ton of white Silesian beet will yield, on the average, 5 per cent of pure alcohol, at 100 degrees of strength."—GUY LUSSAC. "Proof in England is only 56; therefore, as 1 ton of beet produ

50 litres (a litre of water weighs a kilogramme, or 2 lb. 4 oz., less a fraction) of French measure of alcohol at 100 degrees, it produces 19¾ gallons English proof spirit at 56 degrees. . . Fifty litres alcohol, at 100 degrees, are equal to 87 litres at 56 degrees. A gallon is 4.54345797 litres, or about 4½ litres; therefore nearly as may be, 87 litres are equal to 19¾ gallons, so that the produce of a ton of beet is 19 gallons 3 quarts of proof spirit at least. An acre of ordinary land should yield 25 tons of white Silesian beet-root, and therefore will produce 493 gallons of proof spirits. Whereas the best acre of barley ever grown will produce 170 gallons of proof." Calculating the price of the spirit (without excise duties) at 3s. per gallon, the result is £73, 19s. per acre of beet. The residue is, however, an exceedingly valuable feeding material, which, of course, adds to the value of the proceeds of each acre of beet. But of this, further immediately, quoting now, as evidence of the means of disposing of, or the demand which there is likely to be for, the spirits produced from beet, the following: "The spirit being plain or neutral when rectified, ranking after grape-spirit in value and quality, it is fitted for any use to which pure spirit of wine can be applied. It is used for many purposes where a grain spirit is not in favour, such as perfumery, &c. Many thousand gallons of beet-root spirits, paying duty of 15s. per gallon as foreign spirits, are imported from Belgium annually for the use of perfumers and aromatic spirit makers. The spirit is also employed in the fabrication of brandy in the south of France. Two millions sterling in value were employed in this manner in France alone. It is also employed for the arts, for all kinds of chemicals, varnishes, &c."

We now turn to the important subject, the value of the residues of the beet-root distillation for feeding purposes. The slices of beet-root after distillation, or *cossets*, as they are termed on the Continent, contain a large per-centage of the nutriment contained in the root in its normal condition, and have, moreover, the invaluable property of keeping, for a period of one or two years, in a state of perfect preservation, either banked up like potatoes, or kept in reservoirs or pits. "The fermentation," says M. Leplay, "of the slices of saccharine roots in a juice saturated with its own elements, has the effect of leaving to the root its azotic nutritive and other valuable principles, and changing into alcohol the saccharine matter only. The nutritive azotic matters, being essentially fixed by the process of fermentation and heat, are found solidified and coagulated in the slices during the fermentation and distillation, and are thus insoluble in water. When the distillation of the fermented slices has been conducted so that they retain their shape after the operation, they drain off themselves, and thus concentrate themselves into a volume 50 per cent less in bulk, retain- [illegible] principles they contained before their fermen-

tation. The slices thus distilled, and thus cooked by the current of steam, and placed in thick layers in a large tank, in a drained or porous ground, or even exposed to the air, drain themselves, and form a compact mass of the consistency of cheese, which may be kept an indefinite time, and even without being covered with earth." Such is the statement of M. Leplay—a statement corroborated in its chief features by the successful practice of Continental agriculturists, who use the residues, and with whom they are held in high esteem as a valuable feeding material. It is, however, with satisfaction that we are enabled to place before our readers analyses (and remarks) by John Mitchell, Esq., F.G.S., of residues fresh and old, sent him by Messrs Dray & Co. for examination. Mr Mitchell made analyses of fresh mangold-wurzel roots, of which the following is the mean,—

Water,	86.470
Sugar,	8.028
Pectrine and mucillaginous matter,	1.904
Albuminous matter and woody fibre,	2.824
Fatty matter,	traces.
Ammoniacal salts,	traces.
Alkaline and earthy salts,	.774
	100.000

The albuminous matter contains 171.100 of 1 per cent of nitrogen.

Of the analyses of fresh *residue* (pulp), after distillation of mangold-wurzel root, the following is the mean,—

Water,	87.502
Sugar	2.065
Pectrine, and mucillaginous matter,	3.032
Albuminous matter and woody fibre,	5.642
Fatty matter and lactic acid,	traces.
Ammoniacal, alkaline, and earthy salts,	1.759
	100,000

The albuminous matter contains 268.1000 of one per cent, and the ammoniacal salts 84.1000 of one per cent of nitrogen.

Of the analyses of old *residue* (pulp), which has been kept about three months, the following is the mean,—

Water,	85.603
Sugar,	2.038
Pectrine and mucillaginous matter,	3.302
Albuminous matter and woody fibre,	7.100
Fatty matter and lactic acid,	traces.
Ammoniacal, alkaline, and earthy salts,	1.957
	100.000

The albuminous matter contains 270.1000 of one per cent, and the ammoniacal salts 86.1000 of one per cent of nitrogen. "On comparing the above analyses, it will be seen," says Mr Mitchell, "that, during the operations of maceration and distillation, some striking changes have been effected. About three-fourths of the

sugar have disappeared, . . . and the other solid constituents of the *fresh root* have in round numbers been increased *twofold.* The result is at first sight anomalous; but on a careful consideration of the processes to which the root has been submitted (maceration and distillation), the anomaly will disappear. Indeed it is only by a series of analyses such as just cited, and a complete examination of the process in all its steps, that a rational explanation can be afforded accounting for the greatly increased nutritive powers of the residue (pulp) over those of the fresh root."

From the process of maceration which we have already described, it will be perceived that the root, steeped in a liquid rich in various organic as well as inorganic matters, has its aqueous matter gradually displaced by it, and its cellular tissue becomes charged with "nitrogenous and albuminous matters (also doubtless with some of the nitrogenised portions of the natural beet-root yeast formed during the fermentation.") When the roots are removed for distillation, they are thus charged with a much larger proportion than the root naturally contains of alcohol, "with a solution containing organic and inorganic bodies." When the alcohol, in distillation, is drawn off, "the fixed matters," says Mr Mitchell, "albuminous and mucillaginous, remain in the root; hence the apparent anomaly of a large increase in nutritive matter after a portion of the soluble contents of the root have been removed in the shape of alcohol." From a table given by Mr Mitchell, it appears that the residue or pulp contains less of the non-nitrogenised matters than the fresh root; that is, of the element *least* useful for feeding purposes; while, on the contrary, the residue contains more of the nitrogenised or flesh-forming element than the flesh-root, in the proportion of $1\frac{1}{2}$ to 1; "or, in other words, 60 lb. of the residue (pulp) have the same nutritive value as 100 lb. of fresh root, as far as the *formation of flesh* is concerned."

The following recent experiments in the feeding of lambs and ewes on residues, and fresh mangold-wurzel, may be interesting. The experiments extended from February 16 to March 9,—

6 ewes, 3 with 2 lambs, 3 with 1 lamb each—

Per day, ...	$22\frac{1}{2}$ lb. residues.		
. . . . .	3 " cake.		
. . . . .	30 " chaff.		
Weight when put up,	8 cwt.	3 qrs.	8 lb.
First week,	9 "	3 "	0 "
Second week	10 "	0 "	11 "
Third week	[illegible]0 "	2 "	10 "

[illegible] 2 lambs each, 3 with 1 lamb each—

Per day,	15 lb. mangold.		
	30 " chaff.		
	[illegible] " cake.		
Weight when put up,	[illegible] cwt.	3 qrs.	21 lb.
[illegible] week	8 "	2 "	26 "
[illegible]			
	[illegible]	[illegible]	[illegible]0 "
	[illegible]	[illegible]	[illegible]3 "

"It will be observed, that those fed on mangold fell off the first week, and in the second, though mangold was increased, they only recovered the quarter cwt. lost in the first, and in the third a ewe fell ill; thus showing little in favour of raw mangold. Those fed on residues, on the contrary, increased nearly 1 cwt. the first week, 1 cwt. the second, and ½ cwt. in the third." Did space permit, we could give further practical evidence of the value of the residues for feeding, from the experience of Continental agriculturists. Suffice it to state, that M. Didier, of Cairy House, near Soissons, in France, a gentleman who has farmed for the last twenty years 1250 acres, and who has had most extensive experience in the fattening and feeding of cattle, gives it as his opinion, that with no other food can he obtain such an increase in the weight of cattle as he has obtained by the use of residues. The farmers who use it for dairy purposes give equally favourable testimony. They state that the butter from the cows fed on the residues is more solid than when oil-cake is added to the hay, or when green meat is given. M. Didier's plan of feeding, we may observe further, is to weigh his sheep and proportion the ration of food to every 2 cwt. of living sheep. The food for sheep, with residues for 2 cwt. of living weight, is 17 to 18 lb. of residue, 2 lb. 4 oz. wheat husks, 4 lb. lucerne or clover chaff; 1 lb. 2 oz. rape-cake; 1½ lb. litter. It must not be overlooked that this is not the food of 1 sheep, but of 2 cwt. of living sheep. From a statement furnished by M. Didier, it appears that the rate of increase of sheep fed on this principle was above 20 per cent in 100 days, every 2 cwt. of living sheep having increased to 41½ lb. This gave an increase in the 524 wethers fed, of 10,783 lb in all. The consumption of residues was 130 tons of hay and straw chaff. 91 tons at 6d. per lb., the increase of meat (10,783 lb.), would be worth £271, 17s. Taking the hay and chaff at £2 per ton, we find £182 as its full value. This gives £82 as the value of the meat obtained by the residues, the cost of the residues at 10s. per ton being only £65. Another experiment with 180 ewes, showed the value of the residues to be 13s. per ton; and this must be added to the large profit obtained from the sale of the spirits. On this important subject of feeding with residues we could give abundant matter, but space compels us to close our remarks.

In view of the importance of increasing our agricultural produce, it behoves us without prejudice to examine all innovations, no matter how harshly they come in contact with our preconceived notions; and however much we may consider them opposed to the spirit of true progress, freed, on the one hand, from the dogmatism which admits of no good in any new thing, and on the other, from the unstable eagerness of those who, "pleased with a feather, tickled with a straw," see virtue only in novelties, let us examine all things, try all things, and willingly accept the

good that is in them; not carping or quibbling thereat. It is in deed a poor thing which has *no* good in it. Nor let us forge while criticising the crudities of new processes, the difficulti which beset all inventors; that their inventions do not, Minerv like, spring from their brain ready armed. "As the birth," sa Bacon,—and the sentence is one pregnant with meaning—" living creatures at first are ill-shapen, so are all innovations whi are the birth of time." It is but poor folly in view of the " shape" of early, to forget the gifts and graces of matured life.

From what we have said in connection with the commercial an agricultural features of the process of beet distillation, we thin that it is one which demands the serious attention of the agri cultural community in this country. We have seen the pos tion it occupies on the Continent, and the important services has there rendered to agricultural progress. It is no longer, the a chimerical, speculative project, but it is one which has taken decided and a successful place among the industries of the Co tinent. If it has been so rapidly developed there, surely with *ou* business energy and tact, scientific knowledge, and, above all, ou capital, we may place it upon a still broader basis, and open up for a wider sphere of usefulness. In the words of one who ought be an authority, we think the process "is calculated to be the cau of a great increase in the prosperity of the agriculture of our cou try; for not only is a valuable substance (alcohol) obtained fro a root or series of roots not hitherto employed in this kingdom f that purpose, but the residues of the preparation of that alcohol a much more valuable article of food than the original root fro which it was produced."

THE FARMERS' NOTE-BOOK.—NO. LVI.

The Sickle, the Scythe, the Reaping-Machine.—This subject has been suggested to us for consideration by the immense emigration which is at present taking place of our farm-labourers, generally the most able and the most useful during harvest. Already has a deficiency been felt of the ordinary servants of the farm; and still, month after month, Scotland and Ireland send forth their thousands to the colonies, so that the pressure on the labour market becomes more and more severe; and we may well look forward with anxiety to harvest, when an extraordinary demand is made on that market. If, as sometimes happens, the crops become ready for cutting at the same time throughout the country, it will be impossible to find hands to carry on harvest operations, and the risk that will then be run by the farmer will be incalculable. It is therefore incumbent on us to look the difficulty in the face, and try and devise some means by which we can mitigate the evil.

So long as a bounty is given by the Emigration Commissioners, we cannot expect the efflux of our population to the colonies to cease; nor can we by any means increase it during that most important and critical period of the year—harvest. We must therefore try and perform the same work with a reduced number of hands, and this can be done only by the aid of machinery. In making a comparison between cutting grain by the sickle and by the reaping-machine, we have been in the habit of regarding it chiefly as a question of expense; now, however, we are forced to look at it in another light. We must view it more as a question of expediency and of necessity. Our corn must be cut down and harvested—we cannot get sufficient hands to do it for love or money—what means must we adopt to attain our object? This is the question to be answered, the problem to be solved; to aid us in doing which we will now inquire into the number and kind of people required when corn is cut by the sickle, the scythe, and the reaping-machine.

It is calculated that 3 scythemen, with their followers, will, on an average, cut, bind, and stook $4\frac{3}{4}$ imperial acres in the day. To perform the same work with the sickle 18 people will be required, with the Hainault scythe 12, and with the reaping-machine 7. Now these people are distributed in the following manner:—

	Women reaping or gathering, &c.	Men cutting.	Men binding.	Men at Machine.	Child at Rake.
Sickle, ...	15		3		
Scythe, ...	3	3	3		1
Hainault scythe, .	9		3		
Reaping-machine,	3		3	1	

Such, then, are the number and the kinds of people required to cut, gather, bind, and stook 4⅘ imperial acres of wheat, barley, or oats, on an average, according to these different methods. We have not included a raker for any of the implements but the scythe, as one is always held indispensable by those who use it. Of course a horse-rake would be used after the crop was removed from the fields where the others had been used. We have assumed that the reaping-machine, as at present constructed, would cut down 9 or 10 acres in a day of 10 hours throughout the harvest; and as 2 men are required for the management of it, we have allowed 1 for the 4⅘ acres. The Hainault scythe being used by women and girls in Belgium, we have made our calculations accordingly—2 women cutting, and 1 gathering and making ropes, being the complement for each bandster.

Before analysing these figures farther at present, we will inquire as to what class of workers is now emigrating to the colonies. The principal emigration is taking place from the Highlands and Ireland, whose population generally supplied the agricultural districts of England and Scotland with reapers. We must look, then, for a great falling off in the number of these. It is seldom that good bandsters can be got from among the crowds that frequent these districts during harvest. We have often seen active young women better at binding than most of the Highlanders and Irishmen who leave their own country for harvest. Again, in the Highlands and Lowlands of Scotland a drain is being made of a most important class of our rural population, viz., young able-bodied men, married and unmarried, good at all kinds of farm-work, and who are mostly employed during harvest at the scythe, binding, or leading-in. Though there are not so many of these leaving the country as of the other class, still the want of them will be materially felt, particularly as for some years back there have been great complaints of a deficiency in their number, and farmers have been obliged to employ Irishmen in their place, by whom the work has not been satisfactorily performed.

As the greatest number of hands is required for the sickle, it is evident that a general deficiency will be felt by those most who use it, while a deficiency in the number of men usually employed as scythesmen and bandsters will be felt by those most who use the scythe. But of the two there is no doubt that emigration at present will cause the greatest inconvenience to the former, for though there may be a deficiency in men for bandsters, this evil [illegible] in some measure remedied by teaching others to do it, and [illegible] satisf[illegible] the mean time with an inferior class of [illegible] [illegible]ll whose crops are not too [illegible] to reduce their harvest ex-[illegible] [illegible], which will perhaps, at the same time, [illegible] anxiety if people are scarce, and reduce [illegible] breadth of crop ready to cut, and no

person to do it. Of the Hainault scythe, a comparison of the number of people required in the use of which with that of the other implements is most favourable for the former, we will say nothing, as none of our people have been trained to the use of it. But we can only express our surprise that an instrument on which a most favourable report was made about thirty years ago by a committee of the Highland and Agricultural Society, in which it was stated that the "saving by the use of this implement would be from $\frac{1}{4}$ to $\frac{1}{3}$ part of the ordinary expense of reaping by the sickle," has not received more attention from the farmers of Scotland.

Of all the different modes of reaping, however, the greatest saving of hands is obtained from the use of the reaping-machine. It is true, we cannot expect to have all our crop cut by it in its present state, but by the use of it and the scythe very few more people than those ordinarily employed on the farm would be required during harvest, which every farmer must admit would be a great advantage. The reasons given in an article on reaping-machines, in a number of this Journal in 1828, for the use of such machines then, are far stronger and more conclusive now. They are—"1st, All our corn crops come to maturity at present nearly at the same time; 2d. Our country labourers are reduced in number; 3d. There is now a much greater quantity of corn to cut down; 4th. Harvest-work has become more expensive." We hope that the interest excited in them some years ago will not be allowed to flag now, but that members of local agricultural societies, while recognising what has been done by the national society for the improvement of this useful machine, will use every exertion for getting it better adapted to the present and future requirements of agriculture. Already have improvements been made in it with the view of economising labour. The revolving web of Bell's, which delivered the grain as it was cut, but which at the same time added very much to the draught, has had a substitute for it in Atkin's automaton applied in Wright's reaping-machine, which, acting as an arm and hand, lifts the grain in sheaves as it is cut, and lays it on the ground. On this account, only the man who drives the horses is required for driving this machine. Several public exhibitions of this machine at work have been made in France, by which it has been raised very high in the estimation of the agriculturists who witnessed its performance—so much so, that a committee appointed by the Central Society of Agriculture of the Seine-Inférieure to report on the subject, gave as their verdict that "the automaton machine of Atkin and Wright was preferable to all other reaping-machines."

The Cattle-Plague and Diseased Meat, &c. By JOSEPH SAMPSON GAMGEE.—The appearance of this pamphlet is most seasonable at present. In the form of a letter to the Home Secretary, it lifts

a warning voice against the dangers to be apprehended fror importation of cattle from those countries in or near whicl Rinderpest or Cattle Plague has been raging, and against the arising, and likely to be increased, from the consumption ol eased meat. Mr Gamgee states his case boldly. He does nol dark insinuations against individuals, thus throwing suspicio the innocent, and in a measure concealing the guilty: he tions names, he states specific charges, he even tries to brin accused before the authorities; and it now remains with the viduals whose names are mentioned, either to remain silent this charge of guilt upon them, or, by taking legal steps ag their accuser, try to vindicate themselves before the public b proving the charges brought against them. Every one has l of the nefarious system of adulteration of food which is pra in London, and in many other parts of the kingdom, but fe aware of the laxity shown by the authorities in the metropo the inspection of cattle-markets and slaughter-houses. Mr Ga has exposed this in his pamphlet, arraigning the authorities b the bar of public opinion, showing that the officials appointe them as inspectors are over-wrought by their multifarious d and under-paid, and accusing the latter of neglect of duty incompetency. He makes his charges so fearlessly, as non he who was sure of his case would venture to do who value reputation.

In two visits to the New Cattle Market at Islington in M last, he found diseased animals exposed for sale among sound "One of these was emaciated and hide-bound, with abscess various parts of the body, particularly over the region of the and neck. I believe this case was most probably one of pya following typhoid fever. A second beast was in ill-health thin and feverish. A third diseased beast was a fat one; i lying down, moaning, looking round anxiously at its flanks; 110, respiration 45; pleuro-pneumonia." At his second vi found many diseased beasts. "The most remarkable exampl a row of twenty-one very small, very old, and emaciated Several of them bore unmistakable signs of old disease: o hem was moribund; it was standing in the throng, leaning a ts whole weight on the beast near it, striking out its head, pa or breath at the rate of forty times per minute, emitting lumes of hot vapour from the lungs: its eyes were fixed aring in the lean and deepened sockets; in the arteries o xtremities the pulse had ceased to beat; and out of two ers the hinder extremities of the hip-bones protruded thr kin, which seemed artificially stretched over and bound ifeless skeleton." "In reply to my inquiries, an offici ... department made the following statement: ... diseased beasts in the market ... never a m

without them. Often beasts are disgraceful to look at—certainly unfit for human food. Could not say why the inspector did not seize them.' " We leave the inspectors of the Islington market, the Newgate market, and the general inspector of the City markets and slaughter-houses, to answer for themselves.

We do not think that Mr Gamgee has been so fortunate in his strictures on the " Inefficiency of Existing Laws to provide against these national evils." " A variety of acts " (which he cites) " empower inspectors of nuisances, clerks, and others duly appointed, to inspect slaughter-houses, butchers' shops, and other buildings or places where dead meat is exposed or offered for sale; and in the event of such meat appearing to the inspector *unfit for human food*, he may seize it; and a justice of the peace has the power of inflicting a fine not exceeding £20, on the seizure being reported to him and satisfactory evidence adduced that the meat is *unfit for human food.* It is the wording of this expression which renders all but nugatory the acts in which it is employed." Now, we consider the provisions of these acts stringent enough for all practical purposes, and, if faithfully carried out by the authorities, sufficient protection to the public against the sale of diseased meat. Let the authorities appoint efficient inspectors, and let these discharge their duty aright, summon the parties exposing diseased meat for sale before a magistrate, and be prepared to lead evidence by competent witnesses, such as respectable fleshers, veterinary surgeons, &c., and we have no doubt that the evil complained of will be very much mitigated, if not entirely removed. Such is the mode of procedure in Edinburgh, where great vigilance is exercised by the inspector, to the comfort and satisfaction of the consumers. It is true that this officer has an advantage over his brother in London, where there are hundreds of private slaughter-houses, whereas there is but the one *abattoir* in Edinburgh.

Not the least useful part of the pamphlet is that in which the question is discussed as to the evils resulting from using as human food the flesh of animals which have been killed when labouring under particular diseases. Some alarm was felt by those who had not given the pamphlet an attentive perusal, lest the author had stated views which could not be reconciled with the opinions of other veterinarians, were at variance with the experience of farmers and fleshers, and would have the effect of increasing the loss from disease to farmers, and of raising the price of beef to the consumer. "If," said these gentlemen, " the flesh of all animals labouring under disease when slaughtered is to be condemned, where are the beef and mutton to be found to supply the demand?" For it is a notorious fact that most of the animals slaughtered for human food will be found to be unsound in some way or other—in some important vital organ, as in the lung or liver. Indeed, some celebrated breeders and feeders, such as Bakewell, often superin-

duced disease in the animal to get it to fatten more quickly. This was particularly the case with sheep, which were turned on marshy ground to bring on the disease called the rot, in the first stages of which they fattened far more rapidly than if they had been sound. And any one, by examining the shambles, will have little difficulty in discovering specimens of this disease in our best fat sheep, as denoted by their diseased liver, in which the parasite called the fluke is found. The tendency of high-feeding is to bring on disease. We have seen a lot of fine cattle killed which had been fed on clean nutritious food for some months, every one of which had a highly-diseased liver. The disease was so bad that it would soon have put an end to their existence, though it was quite unsuspected both by buyer and seller. The beef was considered and sold as of the best quality. It is generally thought better to slaughter an animal, if in good condition, immediately after it shows symptoms of pleuro-pneumonia, than to run the risk of effecting a cure: it is better both for feeder and consumer—for the former, as the loss is not so great; and for the latter, as he gets his beef at a reduced rate. We knew the case of a farmer whose byre of oxen, nearly all fat, were attacked by this disease. Having some qualms of conscience about sending the animals to market, he took the advice of a veterinary surgeon, who recommended that every animal, immediately after showing symptoms of the disease, should be slaughtered, and he would undertake to get the beef disposed of at a reasonable price, and would show that he did not consider it the worse of the disease by taking a leg of an ox himself. This recommendation was acted on; the beef was sold at a reduced rate, and the demand for it in the district was greater than the supply; indeed, latterly, it was considered a favour to get a portion of the beef on the terms on which it was disposed of.

It may tend to allay the fears of those to whom we referred at the commencement of the last paragraph, when we mention that Mr Gamgee's views coincide very much with those stated above. He says: "It is important to establish that the flesh of animals dying from or with disease is not invariably prejudicial to man; in many cases its injurious effects are extreme, in others they do not appear." "It is a great desideratum to lessen the loss from disease to cattle-breeders and dealers, and to allow a cheap article [illegible] food for [illegible] population, so long as such advantages are not [illegible] counterbalancing evils." Again, "Whereas oxen [illegible] pneumonia frequently die in a few days, their [illegible] the actually diseased parts excepted—with [illegible] impunity [illegible] flesh of malignant anthrax, &c. is [illegible] consequences if partaken [illegible]

[illegible] principally against the [illegible] which he has shown

to be very prevalent. As the metropolis is the great entrepôt for butcher-meat from all parts of England, Scotland, Ireland, and the Continent, favourable opportunities are afforded for carrying on a traffic by which serious injury is inflicted on the health of the population. Aberdeen, also, from which some of the finest beef is sent to the London market, is also exposed, for the negligence of its authorities in allowing diseased meat to be sold in it. Our friends in the far north should take care that the fair name which they have acquired in London and on the Continent, as breeders and feeders, be not blasted by such exposures as Mr Gamgee's, which will tempt the mischievous public to say that they send all the fine meat out of their country, and feed their population on the diseased. We trust that this pamphlet will accomplish the object for which it was published, viz. the putting a stop to the traffic in diseased meat both in London and throughout the country. The matter now rests with those in authority in the cities, towns, and rural districts, as it is mainly by their vigilance and promptitude that the public, and particularly the poorer classes of the community, can be protected against the evils of such traffic.

American Method of Guarding the Wheat Crop during a Wet Harvest.—"LEXINGTON, ROCKBRIDGE COUNTY, VIRGINIA, *May* 15, 1857.—Having remarked that there has been scarcely a year in which I have not noticed much complaint of damage, and sometimes almost total loss of the wheat crop, in England, from continuous rains during harvest, I have thought that I might render an acceptable service to your country, by communicating a method by which this damage and loss may be effectually prevented, and millions of bushels of wheat preserved, which would otherwise be lost or most materially damaged. The method I shall recommend is the result of about thirty years' experience as a farmer, and a part of the time as president of an agricultural society in our State.

"Should the rains continue, so as to afford no opportunity of drying the wheat lying upon the ground, put it up immediately in cocks or small stacks containing five or six bushels, made as sharp as they can be made, by pressing the wheat straw as close as it can be packed, and cap the cocks with a sheaf of wheat. The straw will adhere so closely together as to render these cocks impenetrable to rain; and the internal heat arising from the wet straw will effectually dry and preserve the grain, even during the continuance of the rain. These small stacks should by no means be opened or interrupted until the weather is sufficiently settled to remove them to the barnyard, to be stacked or thrashed. Any attempt to open them during the continuance of the wet weather, for the purpose of drying well, will only loose

the straw (in a manner glued together), and render the cocks accessible to rain. Wheat put up in this way will sustain no loss or the least damage, as to weight or quality, with the exception of the one side of the cocks necessarily exposed to the rain and sun. It is true that the straw will be somewhat moulded; but, from my experience, not so much injured as to prevent both cattle and horses from eating it readily. Should there be a prospect of the rain continuing for many days, I would advise farmers not to wait for clear weather, but to cut their wheat down (as I have done) during the hardest showers, and to put it up immediately as herein recommended; and they may be perfectly secured against all loss or the least damage to the wheat inside of the stacks put up as advised, no matter how wet the straw may be when it is so put up. This is no theory, but the result of well-contested experiment; and I am confident that millions of bushels of wheat may be saved to your country by pursuing this plan in a very wet spell of weather during harvest. As the object is to make the wheat cocks or small stalks impenetrable to rain, I think this object may be best accomplished by not tying the wheat in bunches, loose straw being more compressible than when it is tied up. WM. GAMELL."

[The method recommended by our correspondent is not new to Scotch farmers. Almost every year, in some late districts of the country, it is the practice to throw the sheaves of corn into hand or fork ricks in the field, avoiding as much as possible pressure upon the ricks when they are being built. Last harvest, during the continuous damp weather, we heard this method was very much practised even in what were considered early districts. The ricks are made impervious to rain, so that though the sheaves may be damp when put up, they are made no wetter by the incessant rains, but are in a position, at the same time, to get the advantage of any drought which may arise, and are more rapidly dried by the internal heat which is induced. The corn is allowed to remain in the ricks or cocks till a favourable opportunity is offered for carting it to the [illegible]-yard or barn. By this method sprout is avoided, and the experience of last harvest has convinced many that, in continuously wet weather, during that important season of the year, the grain will suffer less damage when put up in ricks, in the manner described, than [illegible] exposed [illegible] stooks. The cattle and horses in [illegible] straw readily; but those in this [illegible] straits before they would [illegible] reluctance in offering it to [illegible] we had prevented the risk [illegible] from the use of such food.]

[illegible] The results of the com- [illegible] &c., have

not yet been fully appreciated for their manurial qualities. They act both mechanically and chemically. In clay soils they are invaluable for keeping them more open and active, as it were as subsidiaries to the furrow-drains. They at the same time contain some valuable salts necessary for vegetation. The wonderful results produced in many parts of the country by the use of the police manure of towns, which is composed principally of the ashes of the coal consumed by the inhabitants, have tended to raise it much higher in the estimation of farmers than it has been for some years back, and to increase the price of it. In some districts at a considerable distance from Edinburgh, and formerly beyond the limits at which the application of this police manure was considered profitable, from want of proper means of communication, but which are now intersected by railways, the farmers being compelled to use it on account of the high price of guano, have been led to form a most favourable opinion of it from the profitable results obtained. No doubt there is a considerable quantity of both vegetable and animal matter in the police manure, a most effective part of it being the cleanings-out from the public necessaries; but, as we shall presently show, the ashes themselves contain ingredients most valuable for the agriculturist.

While on this subject, we cannot refrain from making a few remarks on the difference in the habits of the English and Scotch labourers as regards cleanliness, and the means adopted by each for furthering this end. Every house in an English village has its necessary adjoining, which is the ash-pit; in it all the fluid and solid excrements, refuse from the house, &c. is mixed with the ashes, producing a powerful manure destitute of smell. How different is the case in a Scotch village! What is the rule in the former instance is the exception here. Scarcely a house has a privy; and if some public-spirited individual, or the authorities, erect a public one during an epidemic, in a short time it becomes a nuisance from the utter disregard of cleanliness which is shown by the inhabitants. Nor is it better about most farm places. We know of farm-houses on farms of from 600 to 700 acres in extent, requiring a capital of several thousand pounds to stock them, which till of late were quite destitute of any such houses; and though they are now attached to all our modern cottages, often they are not used, or become scenes of filth, which extends considerably beyond their precincts along the roadsides. We cannot too strongly impress upon every householder and cottager the great pecuniary loss he sustains (to take no other view of the question at present) by the indulgence of such beastly habits.

At a meeting of the Société Central d'Agriculture, one of the members, M. Becquerel, brought this subject forward. He related that, in the neighbourhood of Vesoul, where there are salt-mines, it was desired to form a garden on a soil of variegated impervious

marl, and almost inaccessible. The cinders from the combustion of the coals were used for the walks, and as there was an abundance of them, they were spread over the soil of the garden besides. In the course of two years, the fruit produced from the trees planted in this garden were the finest, the most delicious, and the most highly prized of any in the district. Other members gave their experience of the value of the cinders and dross from different works as a manure. One applied the cinders of coal to the mulberry-tree with the most eminent success. Another has used iron dross in his garden for the last ten years, and obtained splendid fruits; while a third saw at Laterrière a heap of the debris from the iron-work, on which apple-trees were growing that produced the most delicious fruits.

M. Becquerel attributed these favourable results to the mechanical action of the refuse of these salt and iron works, while M. Boussingault thought that much of the success was to be traced to its chemical composition; for it is well known that coal-ashes contain small quantities of alkaline matters, as well as other valuable ingredients. Professor Johnston found three specimens of coal-ashes from Fife, one from Edinburgh, and one from Argyllshire, to contain on an average of

Potash and soda, ...	1.02 per cent.
Magnesia, ...	3.89 "
Lime, ...	9.87 "
Phosphoric acid, ...	0.91 "

Dr Anderson also found the waste heap of a coal-pit, "which is composed of the ash of the small coal which is burnt at the pit-mouth, mixed with a variety of different sorts of shales, some bituminous and some not, that have been brought up in working of the coal," to contain of

Potash, ...	1.215 per cent.
Magnesia, ...	2.088 "
Lime, ...	6.387 "
Soda, ...	0.760 "
Sulphuric acid, ...	7.538 "

These ashes, when applied to the soil, were found to have a remarkable effect on the growth of clover. These facts abundantly prove to us the value of the ordinary coal-ashes, as well as those of the debris of some coal and other mines, and the profit that is derived from the use of them.

The Use of Guano in the Duchy of Cleves, Prussia.—Some interesting notes have lately been published in a German work on the use of guano by M. Fonck and others, in the duchy of Cleves. Cleves is a circle in Rhenish Prussia, and is noted for the beauty of its landscapes and the fertility of its soil, from which are raised

magnificent crops of grain, turnips, potatoes, linseed, and tobacco. M. Fonck imported directly from London, in 1842, the first sample of guano which appeared in that locality. It consisted of about 8 cwt., and was applied to 2½ roods of rye, which yielded about 52 stones of grain and 65 stones of straw more than an equal extent of land to which about 7 tons 12 cwt. of stable-dung and 16½ bushels of wood-ashes had been applied. In 1843 he repeated the experiment with 12 cwt. of guano, with similar favourable results. In the following year some of M. Fonck's neighbours, now fully alive to the benefits derived from the use of this manure, joined him in importing a considerable quantity. Since then the quantity used has been steadily on the increase, till at present it has reached 6565 tons in the Rhenish province of Prussia.

The soil in this district consists of a due admixture of clay and sand, somewhat homogeneous in its structure. By compression there is a certain degree of cohesion among the particles, which, however, is easily destroyed. The subsoil, without being impervious, retains a due proportion of moisture. On all the soils of the district the experiments with guano have been most satisfactory. And M. Fonck adduces the case of a piece of ground on which he has applied no other manure than guano for the last eleven years with no bad results; on the contrary, the soil has increased in fertility, and the action of the guano is as powerful as ever on it. This is a result different from what is obtained by the Bavarian farmers, who found that, in applying guano year after year on the same soil, the quantity had to be increased to produce the same effect.

The crops on which guano has been found to have the best effects are the oleaginous plants—clover, grasses, turnips, potatoes, tobacco, cabbages; next in the scale are wheat, rye, buckwheat, pease, and vetches, while the applications on oats have not been quite so satisfactory. The cultivation of tobacco, in particular, has been very much increased by the use of guano, which gives the plant a vigour of growth that enables it to choke the weeds. It has also been remarked that the ravages of the slug have been less frequent in autumn since the guano came into use. The modes of its application are very various. On light porous soils, it is generally approved of to plough it in with a light furrow, when sown with spring or autumn cereal crops, as it is found not to have full effect on such soils in dry years. It is sown in general either immediately before the seed, or eight days before it. When used as a top-dressing it is applied early, immediately after the melting of the snow. For rape or a cereal crop in spring it is ploughed in with a light furrow; it is harrowed in with the wheat and rye in autumn, excepting on light soils. It is sown in the drill for the potato, and broadcast on the flat for beet-root and carrots. It is seldom that anything is mixed with it before sowing, which does

not add to its fertilising power, and rarely is it used in a state of solution.

The quantities applied for the different plants are as follows, when no other manure is used :—

	Cwt.		Cwt.		
For Tobacco,	5¼	to	7¾	per imperial acre.	
„ Oleaginous plants,	5¼	to	6¾	„	„
„ Potatoes,	5¼			„	„
„ Wheat and rye,	4			„	„
„ Barley and oats,	2¾			„	„

When farmyard manure is used as well as guano, the quantities applied are as follows :—

Farmyard manure,	12 tons	to	14½ tons	per imperial acre.	
Guano,	1¾ cwt.	to	3¼ cwt.	„	„
Top-dressing of guano,	2 cwt.	to	2¾ cwt.	„	„

One hundredweight of guano is generally reckoned equal to five tons of dung ; an estimate similar to the value put upon it in Scotland.

To give some idea of the great increase in the produce of the crops in the circle of Cleves since the introduction of guano, we subjoin the following figures :—

Produce of Crops before the Importation of Guano.

	Grain. Bushels per imperial acre.	Straw. Cwt. per imperial acre.
Wheat,	16.89 to 19.36	27¼
Rye,	24.16	27¼
Barley,	24.16 to 48.40	17¾
Oats,	48.40 to 60.44	22¾
Buckwheat,	19.31 to 30.22	
Clover, two cuttings,		30¾ to 45 cwt.

Rape and tobacco were not cultivated then.

Produce of Crops since the Importation of Guano.

	Grain. Bushels per imperial acre.	Straw. Cwt. per imperial acre.
Wheat,	33.77 to 38.67	37
Rye,	38.67 to 43.52	45
Barley,	72.51 to 82.19	87
Oats,	72.51 to 96.70	45
Buckwheat,	38.67 to 48.40	...
Clover, two cuttings,		90 to 115 cwt.

Besides this large produce, heavy crops of rape and tobacco are now raised. In addition to the large increase in the weight of the crops, M. Fonck estimates the increase in the nutritive value of the crops, as compared to those grown on poor soils, at 20 per cent.

AGRICULTURAL SUMMARY FOR THE QUARTER.

THE quarter of the year that is past is the most important to the farmer. During it the principal part of the preparation of the land for the crops is executed, and all the seed, excepting that of autumn wheat, committed to the ground. More then depends upon the farmer's skill and exertions, than at any other period, to insure success in his business. The weather, too, is an important element in aiding these exertions and skill, and contributing to the success of the results. Very little of the seed was sown in March this season. The winter being most unfavourable for prosecuting the labour, much remained to be done when March arrived, by the middle of which a few farmers sowed some oats, though a great part of their barley-land had to be ploughed. The fine weather with which this month was ushered in, would have tempted many more to have commenced their seed-time, had they been ready for it. About the third week, when not a few had determined to commence, the weather broke, and continued for three weeks close and wet, sometimes heavy showers of rain falling, at other times a thick mist overspreading the land, during which not the least glimpse of the sun was obtained. The wind was from the east, and the weather, during these three weeks, resembled very much what we had in harvest. About the 12th of April, seed-time was generally commenced throughout the country, and was continued with little interruption till completed. The state of the ground, and the warm showery weather which succeeded immediately after sowing, caused a rapid braird, which was doomed to suffer severely in May from the ravages of insects. The slug, the wireworm, the grub, attacked several fields with such virulence as to render it advisable to plough them up. We have not seen for many years such destruction committed by these vermin. Fortunately, in the beginning of June, the weather changed to heat and showers, and for four or five successive days from the seventh of that month, a heavy and constant rain fell, similar to what we had last year at the same time, when such fearful havoc was caused in France by the overflowing of the rivers; with this difference, however, that the temperature was much lower last year than it has been this. Generally speaking, the crops are somewhat later than usual at this period; but much depends upon the weather of July for bringing them to maturity. Potatoes have a vigorous and promising appearance, and there have been fewer complaints of the attacks of the turnip-fly than for some years. In so far as the appearance of the crops is con-

cerned, we consider the prospects of the farmer favourable. The markets, however, for the inferior grains of last year, have not maintained that rise which took place about six weeks ago. Stock of all kinds is as high as most people recollect of its being at any period during this century. The previous low price of beef, by increasing the number of consumers of it, has no doubt contributed to the present high price of fat cattle, as beef has, in a measure, become a necessary article of diet with them.

The Elections.—One of the most important events of the last quarter was the Parliamentary elections, in which the farmer, with the other members of the community, was interested, but which was generally regarded by him with his wonted apathy. The appeal being made to the country on a comparatively unimportant question of foreign policy, no great principles being announced for and against which parties might struggle, all being agreed as to the necessity of Parliamentary reform, the contest at the elections was distinguished by its personal character, and the comparative absence of party spirit. The votes of the electors were recorded generally for the candidates, more from their personal character than as representing any particular principles. Never, then, was a better opportunity offered for a union among agriculturists, to obtain representatives who would show a particular concern for their interests. The circumstances which transpired shortly before the dissolution of Parliament on the guano question, showed the necessity for this union. The county members are generally regarded as the representatives of the agricultural interest. They represent the landed interest, no doubt, as distinguished from the manufacturing and commercial interests; but the indifference of all the members to what actually concerns the practical farmer would lead one to suppose that he had no representative. The farmers ought, therefore, to have associated themselves at the late elections, and pressed upon the candidates the importance of considering those questions which so deeply affected [illegible]heir interests.

We have often thought that the re-establishment of the Board of [illegible]griculture would be advantageous to the farmer, in providing a body whose only duty would be the attending to the interests of [illegible]griculture. Or if such a proposal smells too strongly of the [illegible]aking of places for the favourites of Government, the farmers [illegible]ould form themselves into an association, and appoint a com[illegible]ttee of their number to watch over any measures brought into [illegible]arliament affecting their interests. It is somewhat strange that, [illegible]ses are enabled to hold public meetings and [illegible] on questions which concern themselves, the [illegible] for the same object, but wait [illegible] Society to work [illegible]. To

show what can be done by an association of farmers, we may mention that, at the late election, the members of a farmers' club appointed some of their number to wait upon a candidate for a county representation, and bring prominently before him those questions which have been very much agitated of late among agriculturists. This was done, and so much importance did the candidate attach to these questions, that, on the nomination day, they formed a principal part of his speech; while, if they had not been brought under his notice, they would probably have been overlooked altogether. It only remains for the members of this club to follow up what they have begun, and impress upon the same gentleman who now represents them in Parliament, the importance of attending to these questions when discharging his senatorial duties in London.

Wool Sales.—The healthy tone of the wool market for some time back, and the success attending the sales established by Mr Girdwood, have induced several others to follow his example, and in fact outbid him in the tempting offers they make to consigners, by promising premiums for the wools best washed, and of best quality, and by the reduction of commission. People praise them for the public spirit manifested by the offer of these premiums. For our part, we see as much public spirit in the grocer who gives a piece of sugar-candy to a child, to obtain the custom of its mother—in Professor Anderson or Signor Bosco, who award premiums for the best conundrums, in order to have full houses—in the country merchant, who makes a present of a new gown to the hind's wife, who spends her husband's money in his shop. In all the cases, it is one for the customer and two for the apparently public-spirited and generous donors. The field is wide, and there is plenty of ground unoccupied for any enterprising broker who may choose to squat on it. Farmers will not complain of a little competition, but let that be conducted on fair and honourable terms; let the business be carried on on just commercial principles. Our motto is, "Live and let live;" and the lower the expenses to the farmer, at which the brokers are enabled to conduct their business with a fair profit to themselves, the better for the farmer. But there is a limit beyond which it will not be safe for either the consigner or the broker to go; for the farmer will be the first to suffer, if the business of the broker is conducted on losing terms. At present, owing to the high price of wool, the broker will be enabled to charge a much lower commission, with profit to himself, than if the price were low; and it is likely that the bait of a low commission will be held out to farmers, when they can best afford to pay a good commission, with the prospect of having it raised during a depression of the wool market, when they can less afford it.

The improvement which has taken place in the preparation of

the wool for the market, since the establishment of the wool sales by Mr Girdwood, has been most marked. It has been much greater than was ever anticipated by the warmest supporters of these sales. Shortly after the erection of the Corn Exchange in Edinburgh, a number of farmers, interested in the proper washing and preparation of the fleece, and dissatisfied with the little encouragement given by the dealers to this operation, began to talk of getting a sample wool market established in Edinburgh in the Corn Exchange. It was while the question was being agitated that Mr Girdwood, unknown to some of the farmers even by name, issued his circular announcing his intention of commencing wool sales in Edinburgh, one main feature of which was to be the collection of the stock of wool in Edinburgh previous to the sale. Being convinced that the plan proposed by Mr Girdwood was preferable to what had been merely mooted by them, some of them gave him their hearty support. The results of the first sale fully justified their decision; it was seen at once that the extra trouble spent in washing and preparing the fleece, would be fully repaid by the extra price obtained at these sales; and many, who had become somewhat carelesson this point, from the indifference shown by the buyers to it, reverted to their previous plan of carefully dressing the fleece. And every year there has been a manifest improvement in the condition of the fleeces, as attested to us by the buyers. This has been accomplished, not by the awarding of premiums by Mr Girdwood, or any one else, but by the far more satisfactory and substantial rewards of a higher price, and the publication of the name of the farm from which the wool was sent, and the price at which it was sold. We think, therefore, that considerable merit is due to Mr Girdwood for establishing these sales on their present footing, and he has proved himself worthy of the thanks of both the growers and the manufacturers for the improvement which has been effected in the condition of the fleece, by the manner in which these sales have been conducted.

Societies.—As usual, a number of scientific and agricultural societies have held meetings during the last quarter, at which most [illegible]mportant subjects have been discussed, interesting both to the [illegible]armer and to the [illegible] at large. At a meeting of the Chemical Society o[illegible] April last, an able paper was read by Mr [illegible]ugald Campbell, on [illegible] *[illegible]ication of Sewage to Agriculture.* [illegible] paper which has appeared on this deeply [illegible] subject, in which the history of the question, [illegible] oyed for using it, and the analyses of the [illegible]s, are given in detail. After a thorough [illegible] subject, Mr Campbell sums up in the following [illegible] my subject I cannot but remark, that by [illegible] obtain a highly

valuable solid manure from town sewage alone; and every day the matter gets more and more complicated, from the fact that it is the natural tendency of the population of this and all civilised countries, to have an increased supply of water. In New York, 100 gallons per head of population *per diem* is the present supply; still I think I have demonstrated, and without exaggeration, that the money-value of the manuring matters alone in the London sewage is £836,834 annually; and in the other towns, according to population, it may be taken as proportionably valuable. I have also given you a statement of the value of irrigation by sewage, which I believe has been successful in nearly every instance in which it has been tried; and I would observe, that before running a valuable article away from any town to waste, I think, were the case remitted to a combination of engineering, geological, agricultural, and chemical skill, perhaps a portion, if not, in some instances, the whole, might be saved." The Emperor of the French, having lately turned his attention to this subject, has, with his usual promptness, ordered experiments to be carried on with the sewage of Paris, which have hitherto been most successful.

Closely connected with this subject is that of *Disinfectants*, which was introduced by Dr Smith of Manchester, at a meeting of the Society of Arts, London, and gave rise to a most interesting discussion. Dr Smith, in conjunction with Mr M'Dougal, has the merit of discovering "Mr M'Dougal's Disinfecting Powder." The base of this salt is magnesia, which is the only substance which gives an insoluble ammoniacal salt, preserving the ammonia at the same time, whilst it forms one of the essential elements of plants. Of all acids, sulphurous acid was the best for combining with the base, as it was equal in power to chlorine, but not possessing the same destructive quality in decomposing ammonia. Carbolic or phenic acid from coal-tar, being closely allied to creosote, possessing the same power of preventing decomposition in bodies, is also one of the ingredients of this powder. It has been tried with eminent success in stables and transport ships, where, by its use, all those disagreeable odours arising from close ill-ventilated places, where many animals were kept, were entirely prevented. The method of using it in these places was very simple—by sweeping the floors clean, and sprinkling the powder over them in the same manner and quantity as is done with sand. Though no experiments have been tried with it on sewage, Dr Smith expresses complete confidence in its being successful when applied to this purpose. The fetid and noxious gases which are formed in the common sewers, and produce such mischief to all who reside in their neighbourhood, are, according to Dr Smith, never to be allowed to be produced, but are to be arrested at the very commencement of their formation by the powder, after the applica-

tion of which the sewage water will become perfectly innocuous. Here, then, we have the commencement of that "combination of engineering, geological, agricultural, and chemical skill" alluded to by Mr Campbell in his paper, read before the Chemical Society of London. During the discussion which followed the reading of the paper, much interesting matter was brought out—the different methods, in fact, employed by the different nations, from the earliest period till now, for disposing of the vegetable and animal refuse matters collected where there was any considerable population, such as that enjoined by Moses, which consisted of burning all such matters outside the camp. The same plan was also followed by our soldiers in the Crimea.

Two most important subjects have also been discussed at the meetings of the London Farmers' Club—viz. the stacking and threshing of grain, and "the boarding, lodging, and maintaining yearly agricultural servants; the best and cheapest mode of doing so." The resolution of the Club on the first subject was, "that it is desirable, both as respects convenience and economy, to place the corn-stacks of the farm at the time of harvest in groups in different directions, as contiguous to the farm homestead as may be, removing them to the threshing barn as wanted. That field-threshing, as recently practised, is not to be recommended, except under peculiar circumstances." Much can be said for, and against this resolution. That there is greater security in case of fire, and the grain more quickly secured in harvest, by stacking in groups in different directions, than in carting it all directly to the stack-yard, there can be no doubt. Indeed, in the case of fields lying far from the steading, we would recommend the practice to be followed in most seasons. But against the practice, in ordinary cases, it may be urged that the thatch, &c., have all to be carried from the steading and back again, after the stacks are threshed, while they are much more exposed to the attacks of rooks and other depredators, when built in groups away from the steading. We are glad to find that the Club condemns field-threshing, which is a most slovenly practice.

As regards the second question—viz. the boarding, &c. of farm servants, the Club highly approved of the plan recommended by Mr M[illegible] [illegible]n is that followed in Lincolnshire. It is this: [illegible] lodged and boarded with the foreman, who is [illegible] respectability, who takes a charge of them on [illegible] [illegible]ing on a strict observance of the [illegible] duties of these days. Their dietary consists, [illegible], of hot bread and milk, and cold meat; for dinner, of [illegible]es, and puddings, vegetables, and one pint of ale; for [illegible] bread, and milk or pea-soup. By this means [illegible] meat three times a day, milk twice, and beer [illegible] agricultural

labourers in Scotland, more particularly those who are doomed to the comfortless shelter of a bothy.

Poissy and Austrian International Shows.—The show of fat stock at Poissy, to which we alluded in our last summary, took place in the beginning of April, and was most successful. About sixty cattle and one hundred sheep from Britain were exhibited, in nearly equal proportions from England and Scotland. The French stock exhibited—particularly the crosses between the native breeds and some of the British breeds—were distinguished for their great size, but contrast unfavourably with those from this side of the Channel in symmetry and quality. More than its own share of the prizes were gained by Scotland; and the high prices realised for the animals sold, together with the very handsome premiums awarded, have made it rather a lucky speculation for the exhibitors. Rather a novel part of the exhibition was the dinner, at which the judges were entertained and feasted with the flesh of the prize animals cooked in different ways. As might be expected, the cuisine was admirable; and some idea may be formed of the duties that the judges had to perform, when we mention that they were obliged to partake of eight soups, eight specimens of boiled beef, eight of roasted mutton, thirteen of roasted beef, fish, roast fowl, veal, roast pork. These were well washed down with a dozen or more of the choicest kinds of wine, sherbets, &c., which tended at the same time to whet the palates of the judges, and improve their critical acumen in the gastronomic work in which they were engaged. We have no doubt that, to the British jurors at least, this part of their duties, however agreeable, was not the least arduous. We have little confidence in the decisions arrived at, for an individual will decide in a matter of taste quite in accordance with its previous culture; and it is scarcely to be expected that a body of jurors, such as that we are considering, composed of men from different nations, so dissimilar in habits and tastes as France and England, for instance, could have the same opinions as to what constituted the excellence of the dishes presented to them. Besides, the method of cooking would have different effects on the different kinds of flesh, improving some more than others, and *vice versâ.* There was one part of the experiment, however, which must prove useful and interesting, viz., the weight of each specimen was taken before and after being cooked, and the time taken to make it ready was noted.

From all accounts we have seen, the Austrian Agricultural International Exhibition does not come up to the Paris one of last year; whether from want of the same munificence shown by the French Government, or from want of proper steps being taken to publish it throughout Europe, we are unable to say. The fine display of cattle and sheep made by Austria at the Paris Exhibition showed that it had within its own territories sufficient to make

a good exhibition. And such has been the case at Vienna this year, where the Exhibition is said to have surpassed anything ever seen there before, and contained horses, cattle, and sheep from Austria and its provinces, which elicited the admiration of foreigners. The show of implements was more varied, containing specimens from our principal makers, who have all shared in the honours distributed. There has been for some time an extensive trade in implements between this country and Austria, and we are sure that this year's Exhibition will tend to increase it. There are several patriotic noblemen in Austria, Hungary, &c., who are anxious to improve the agriculture on their estates by every means in their power; and no expense has been spared by them in introducing improved implements from this country. The care bestowed by them upon their Merino sheep is well known; and the results of that attention, as exhibited at Vienna, amply rewarded them for it.

Decisions on the Law of Master and Servant.—During the quarter several of these have occurred, and we regret that the misunderstandings between masters and servants have been so frequent of late as to make an appeal to the law courts necessary for the adjustment of their differences. It has become very common for servants engaged for a certain time to desert their service on being offered more eligible situations elsewhere. As a warning to servants in general, we cite the case of James Law, decided at a justices' court in Forfar. Law was engaged for a year from Martinmas last; but being offered higher wages to go to Essex, he accepted them, and left his place for England the morning after. Fortunately he was apprehended at the railway station when about to start, and brought before the justices. He pleaded guilty, and was sentenced to forty days' imprisonment. The justices had it in their power to inflict sixty days' confinement.

A master has been found liable in damages to a workman employed by him in performing some mason-work at the premises of the Wallace Foundry, Dundee. The scaffolding on which the workmen were standing while at work gave way, and Haggart, the pursuing workman, was injured. It was proved that the scaffolding was made of old insufficient timber, and as it is the bounden duty of every employer to provide for the security of those employed by [illegible] [illegible] engaged at work [illegible]t was decided against the master.

[illegible]ll-[illegible] [illegible] been given in the Justice of Peace [illegible] [illegible] accommodation provided in bothies [illegible] find that exertions made by Lord Kinnaird [illegible] Oath[illegible] and others, in improving these [illegible] [illegible]ied ploughmen, should have been so tardily [illegible] proprietors, as to g[illegible] opportunity for such [illegible] which took place [illegible] Montrose lately. The

house in which the servants at the Haughs of Kinnaird were obliged to lodge in was a disgrace to the proprietor and the district. We are glad to find that the bothy described in the court was believed to be the worst in the county of Forfar, for certainly the pigs on the farm could scarcely have been worse housed; and we are not at all astonished that, from personal inspection, the agent for the servants should have discovered "that the vagrants and criminals suffering punishment were lodged in a state as to cleanliness, ventilation, and general comfort, compared with which the accommodation at Haughs of Kinnaird was misery and wretchedness." The justice held that a servant would be quite justified in leaving his place, provided he "went about it in a legal way," if such accommodation as that described was given to the servant as part of his wages.

Two cases have lately been decided regarding the work to be performed by farm-servants on Sundays. A girl was engaged as out-door servant in the county of Elgin for a half year, from Martinmas last. She was ordered on a Sunday, after the sowing of the crop, to herd the crows off a field of oats, at which occupation she had been engaged for the three previous days. She refused to go on the Sunday, stating that the work required of her was not one of necessity, and she was accordingly dismissed. She brought an action against her masters for payment of her wage. It was proved in court that it was a regular practice at that season of the year for out-door workers to herd crows on Sundays off newly-sown fields; that so destructive were these animals in that district, that much of the crop would be destroyed every year if they were not kept off by firing guns (which was done even on Sundays) and other methods, and that consequently it was a work of necessity which the girl was ordered to perform. The Sheriff held that it was a work of necessity, and that consequently the servant, having disobeyed the orders of her masters, was not entitled to wages.

A decision by Sheriff Riddell in Haddington is in direct opposition to this. John Handyside, a servant of Mr Sadler's, Ferrygate, having refused and neglected to drive four cart-loads of cut turnips from the turnip-shed into the cattle-courts at Ferrygate, and having thereby neglected to fulfil his contract, had incurred the penalties enacted by the statute, which enjoins that "if any servant of husbandry shall not have fulfilled his contract, or hath been guilty of any other misconduct or misdemeanour," he may be imprisoned for a period not exceeding three months, or in lieu thereof, the servant's wages may be abated in whole or in part. It is the practice on most large farms for the ploughmen in rotation to remain at home on Sundays to look after the horses, while the others are at church; the servant acting in this capacity is called the "Scogie." It is also the practice, and has hitherto been held to be

a part of the duty of the Scogie, to drive turnips to the cour where the cattle are fed, so as to enable the man who looks aft the cattle to get through his work more quickly, and be in time fo church. We understand that about a dozen farmers bore eviden in this case, that this was the practice in the county of Ea Lothian, and that the men followed it, though it had not bee mentioned to them, when they were engaged, that they were re quired to do so. It was pleaded for Handyside (who did not den being Scogie on that Sunday) "that it was no part of an ordina hind's duty to assist in feeding cattle on Sundays regularly, and rotation with the other servants, especially as nothing had bee said to Handyside about doing so when he was hired, and as practice prevailed in the neighbourhood of Ferrygate, by whi the whole duty of feeding the cattle on Sundays was discharged b persons engaged for the purpose, without the ordinary farm-se vants being asked to do so." The Sheriff found that the serva had not contravened the statute referred to above. With all du deference to the wisdom, and with a full appreciation of the leg knowledge displayed by Sheriff-substitute Riddell in this case, w must express our dissent from the decision. We do so on th grounds of law, custom, and equity; of law, as it has already bee found in the case of *Wilson* in 1844, that a servant hired for ou door labour was found not entitled to refuse to attend to the catt in his turn on Sabbath; of custom, as it has been the practice, no merely on Mr Sadler's farm, not merely in East Lothian, but other counties in Scotland, for the Scogie to drive the turni (which are generally put into the carts on Saturday night) to th cattle in courts on Sunday, though nothing was said about th part of the duties when the servant was engaged; of equity, whi is defined to be, "the treating of a person according to justice an reason," as the evidence bears that both justice and reason we on the side of the master, though the decision of the Sheriff ha been against him. We hope that the case, or a similar one, will b tried before another tribunal, where both law and equity are bett understood than at the Sheriff-substitute Court of Haddington and as the principle is one of considerable importance to the agr culturists of Scotland generally, we trust that, if it should b carried to the Court of Session, they will not allow Mr Sadler t bear all the legal expenses.

Guano.—Reports having been lately received of discoveries of th important manure on several of the West India Islands, public atten tion has again been directed to the subject. Several samples hav been sent home and distributed amongst farmers for experimen Those which we have seen are specimens of a very inferior guan containing, as might be expected from the very heavy rains whi fall in the West Indies, faint traces of ammonia; while about 4

per cent of sulphate of lime and 20 per cent of phosphates are the principal ingredients. The sulphate of lime would lead to the suspicion that it was not properly a guano, as it is never found in that from Peru, and rarely, if ever, in other kinds, so far as we recollect. We regret to say that the reports of the variety from the Kooria Mooria Islands are anything but encouraging. In quality it appears to be no better than Saldanha Bay, and can therefore never be brought into competition with the Peruvian. The report of Captain Freemantle on the deposits at the Kooria Mooria Islands, dated so far back as 1854, gives us little to hope for a superior quality of guano in that quarter. Indeed, the climate of these islands is very much against a valuable deposit being formed on them. Captain Freemantle says: "From the appearance of the island generally (Huskie), and the gullies especially, there is reason to suppose that at certain seasons of the year rain falls freely. We know that, for at least three months in the year, a strong and fiery breeze blows incessantly over the island." The speech of Sir James Graham in Parliament has certainly thrown a damper on the question, as he "expresses his belief that these islands will be found utterly unproductive of guano of good quality." We are glad to find, however, that Ord, Hindson, and Co., the proprietors of it, are still sanguine of the quality being good, and are making great exertions for its importation in time for next crop. A screw steamer is to be employed to protect British shipping engaged in the guano trade at these islands. An inferior guano, resembling Patagonian in composition, has been used in some parts of Prussia of late, under the name of Guano de Sardaigne.

Road Reform.—Lord Elcho has withdrawn his bill on this subject for this session. We trust that he will find his hands strengthened by the country before another session. There is no county which has gone so fully into the question, bestowed so much pains, and offered so many useful hints on it, as Lanark, whose conduct is worthy of being imitated by all the other counties.

Threshing Machines.—The introduction into Scotland of several of Clayton, Shuttleworth, and Co.'s threshing machines, has directed the attention of farmers to the cleaner threshing of their grain. The great superiority evinced by these over those constructed in Scotland, is too great to require any remarks in their favour here. We hope that our mechanics will take a leaf out of the book of their southern brethren, and begin to improve those at present constructed by them.

Cattle Murrain and Hog Cholera.—The great alarm raised about two months ago regarding the cattle murrain, or *Pest Bovine*, which was raging in Russia and Poland, and caused the death of thousands of animals, has somewhat subsided. We do not think, however, that the measures taken by Government have been

sufficiently stringent to prevent the importation of it to country. No cattle should be allowed to enter any port ir kingdom, from any of the Baltic ports, or from Holland, or country north of France. There was some anxiety regai what was called the Hog Cholera, which was treated as somet new. We have often, and several years ago, seen pigs atta in the manner described under the head of cholera. It reser very much epilepsy, or fallen sickness.

FIARS PRICES of the different COUNTIES of SCOTLAND, for Crop and Year 1856, *by the Imperial Measure.*

ABERDEEN.

	Imp. qr.
Wheat, First - -	42/6
—— Second - -	36/6
Barley, without fodder	35/4
—— with fodder -	40/10
Bere, First, without fod.	34/9
——— with fodder	40/3
— Second, without fod.	33/3
——— with fodder	38/9
Oats, Potato, without fod.	20/
——— with fodder	26/6
— Common, without fod.	19/
——— with fodder	25/6
Pease - - - -	30/11
Beans - - - -	28/11
Malt, duty included -	62/
Oatmeal, per 140 lb. -	16/11

ARGYLL.

Wheat - - - -	55/6
Barley - - - -	36/4
Bere - - - -	37/6
Oats - - - -	27/4
Beans - - - -	44/4
Oatmeal, per 140 lb. -	19/9¾

AYR.

Wheat - - - -	49/3¾
Barley - - - -	38/9¼
Bere - - - -	33/5¼
Oats - - - -	21/0¼
Pease - - - -	43/
Beans - - - -	44/8¾
Oatmeal, per 140 lb. -	18/7½

BANFF.

Wheat - - -	46/1
Barley, without fodder -	37/1
—— with fodder -	42/1
Bere, without fodder -	34/2
with fodder -	39/2
Oats, Potato, without fod.	22/
——— with fodder	28/6
— Common, without fod.	20/7
with fodder	27/1
Pease - - - -	33/4
Beans - - - -	31/
Rye - - - -	
Oatmeal, per 140 lb. -	16/2

BERWICK.

Wheat - - -	38/8 $\frac{8}{12}$
Barley, Merse - -	35/6 $\frac{1}{12}$
—— Lammermuir	35/3 $\frac{4}{12}$
Oats, Merse - -	24/2 $\frac{8}{12}$
—— Lammermuir	19/11 $\frac{4}{12}$
Pease - - -	38/11 $\frac{11}{12}$
Oatmeal, per 140 lb.	20/7 $\frac{8}{12}$

BUTE.

	Imp. qr.
Wheat - - - -	50/10¾
Barley - - - -	40/10½
Bere - - - -	37/
Oats - - - -	25/3
Pease and Beans -	44/
Oatmeal, per 140 lb. -	19/2½

CAITHNESS.

Barley - - - -	33/6
Bere - - - -	31/11
Oats, Angus - -	20/11
—— Sandy - -	
Oatmeal, per 140 lb. -	18/1

CLACKMANNAN.

Wheat - - - -	43/8¾
Barley, Kerse - -	39/6
—— Dryfield - -	38/0½
Oats, Kerse - - -	24/10½
—— Dryfield - -	22/6
Pease and Beans - -	36/9
Malt, duty included -	73/3
Oatmeal, per 140 lb. -	18/10

DUMBARTON.

Wheat - - - -	50/2
Barley - - - -	41/2
Bere - - - -	39/2
Oats - - - -	24/4
Pease and Beans -	42/11
Oatmeal, per 140 lb. -	20/1

DUMFRIES.

Wheat - - - -	56/6
Barley - - - -	40/
Bere - - - -	
Oats, Potato - -	24/2
—— Common - -	22/2
Rye - - - -	39/10
Pease - - - -	
Beans - - - -	47/10
Malt - - - -	86/
Oatmeal, per 140 lb. -	18/1½

EDINBURGH.

Wheat, First - -	40/
—— Second - -	35/
Barley, First - -	36/4
—— Second - -	32/
—— Third - -	28/
Oats, First - - -	23/
—— Second - -	20/
Pease and Beans - -	37/6
Oatmeal, per 112 lb. -	15/4
——— 280 lb. -	38/6

ELGIN AND MORAY.

	Imp. qr.
Wheat - - - -	55/5
Barley - - - -	40/9
Oats - - - -	25/11
Rye - - - -	37/8
Pease and Beans - -	48/
Oatmeal, per 112 lb. -	16/10

FIFE.

Wheat, White - -	40/3 $\frac{8}{12}$
—— Red - -	34/6 $\frac{4}{12}$
Barley - - - -	36/8 $\frac{8}{12}$
Bere - - - -	
Oats - - - -	22/3 $\frac{6}{12}$
Rye - - - -	32/8 $\frac{8}{12}$
Pease and Beans -	29/0 $\frac{6}{12}$
Malt - - - -	61/4 $\frac{7}{12}$
Oatmeal, per 112 lb. -	15/8 $\frac{8}{12}$
——— 280, -	39/3

FORFAR.

Wheat, without fodder	35/4
—— with fodder -	
Barley - - - -	34/
Bere - - - -	34/5
Oats, Potato - -	22/2
—— Common - -	21/
Rye - - - -	30/
Pease and Beans - -	30/7
Oatmeal, per 140 lb. -	16/10

HADDINGTON.

Wheat, First - -	53/
—— Second - -	42/10½
—— Third - -	38/
Barley, First - -	45/4¾
—— Second - -	41/4½
—— Third - -	37/3¾
Oats, First - - -	32/10
—— Second - -	27/1½
—— Third - - -	24/2¾
Pease and Beans, First	
——— Second	
——— Third	

INVERNESS.

Wheat, without fodder	48/10
—— with fodder -	53/10
Barley, without fodder	36/3
—— with fodder -	41/3
Bere, without fodder -	32/
—— with fodder - -	37/
Oats, without fodder -	24/5
—— with fodder -	30/11
Rye, without fodder -	31/6
—— with fodder - -	36/6
Pease, without fodder -	
—— with fodder -	
Oatmeal, per 112 lb. -	16/7

FIARS PRICES—*Continued.*

KINCARDINE.

	Imp. qr.
Wheat, without fodder -	36/5¾
——— with fodder -	44/5¾
Barley, without fodder	33/0¾
——— with fodder -	38/0¾
Bere, without fodder -	33/8¾
—— with fodder - -	38/8¾
Oats, Potato, without fod.	19/11¾
——— with fodder	25/11¾
—— Common, without fod.	19/11¾
——— with fod.	25/11¾
Pease, without fodder -	30/5¾
——— with fodder -	38/5¾
Beans, without fodder -	30/5¾
——— with fodder -	38/5¾
Rye, without fodder -	30/11¾
—— with fodder -	38/11¾
Oatmeal, per 140 lb. -	17/1¾

KINROSS.

Wheat - - -	33/10½
Barley, First - -	33/1
——— Second - -	30/1
Bere, - - -	
Oats, First - - -	21/1
—— Second - -	17/7
Pease - - - -	
Oatmeal, per 280 lb. -	36/6

KIRKCUDBRIGHT.

Wheat - - -	58/10
Barley - - -	39/8
Oats, Potato - -	23/4
—— Common - -	•
Beans - - -	
Oatmeal, per 140 lb. -	17/8½

LANARK.

Wheat, First -	50/6
——— Second -	42/1
——— Third -	39/0
Barley, First -	35/4¼
——— Second -	22/8¾
Bere, First -	30/8
—— Second -	
Oats, First - -	23/1
—— Second -	20/2¼
Pease, First - -	
——— Second -	
Beans, First -	43/5
——— Second -	37/0
Malt - - -	58/8
Oatmeal, First, per 140 lb.	19/8½
——— Second, do.	17/11½

LINLITHGOW.

Wheat - - - -	35/3
Barley - - - -	37/2
Oats - - - -	23/7
Pease and Beans - -	37/10
Malt, duty included -	63/10
Oatmeal, per 140 lb. -	19/0
——— 112 lb. -	15/4

NAIRN.

	Imp. qr.
Wheat - - - -	53/
Barley, without fodder	38/6
——— with fodder -	45/
Oats, without fodder -	24/9
——— with fodder -	33/6
Oatmeal, per 112 lb. -	17/8

ORKNEY.

Bere, per 352 lb. -	22/6
Malt, per 140 lb. -	15/6
—— with duty - -	24/
Oatmeal, per 140 lb. -	15/9

PEEBLES.

Wheat, First - -	42/9¾
——— Second - -	36/2¾
——— Third - -	31/8½
Barley, First - -	39/2½
——— Second - -	36/
——— Third - -	31/7
Oats, First - - -	23/6¼
—— Second - - -	21/5
—— Third - - -	19/9¾
Pease and Beans, First	48/2¾
Second	43/11
Third	35/3¼
Oatmeal, per 140 lb. First	19/2¾
Second	18/0¾
——— Third	17/6¾

PERTH.

Wheat, First - -	43/
——— Second - -	31/6
Barley, First - -	37/4
——— Second - -	30/6
Oats, First - - -	23/7
—— Second - -	21/1
Rye - - - -	
Pease and Beans - -	33/11
Oatmeal, per 140 lb. -	20/3

RENFREW.

Wheat, First - -	49/8¾
——— Second - -	48/1½
Barley, First - -	40/8¾
——— Second - -	39/1½
Bere, First - -	38/4
—— Second - -	
Oats, First - - -	25/6
—— Second - -	23/8¾
Beans, First - -	42/
——— Second - -	41/6½
Oatmeal, per 140 lb. First	19/11
——— Second	19/10¾

ROSS AND CROMA

Wheat, First - -	
——— Second - -	
Barley - - -	
Bere - - - -	
Oats, First - - -	
—— Second - -	
Pease - - - -	
Beans - - - -	
Malt, - - - -	
Oatmeal, per 140 lb. -	
Barley-meal - -	

ROXBURGH.

Wheat - - -	
Barley - - -	
Oats - - -	
Rye - - -	
Pease - - -	
Beans - - -	
Oatmeal, per 140 lb.	

SELKIRK.

Wheat - - -	
Barley - - -	
Oats, Potato - -	
—— Common - -	
Pease - - - -	
Oatmeal, per 280 lb. -	

STIRLING.

Wheat - - - -	
Barley, Kerse - -	
——— Dryfield - -	
Oats, Kerse - -	
—— Dryfield - -	
—— Muirland - -	
Beans - - - -	
Malt - - - -	
Oatmeal, per 140 lb. -	

SUTHERLAND

Wheat - - - -	
Barley - - - -	
Bere - - - -	
Oats - - - -	
Rye - - - -	
Pease - - - -	
Oatmeal, per 140 lb. -	

WIGTOWN.

Wheat - - - -	
Barley - - - -	
Bere - - - -	
Oats, Potato - -	
—— Common - -	
Rye - - - -	
Pease - - - -	
Beans - - - -	
Malt - - - -	
Oatmeal, per 280 lb. -	

WE may inform our English readers, that Fiars Prices are the average pr grain, as ascertained every year, by the verdict of Juries, in every County o land. The Juries are summoned in spring, and ascertain, from the evidence pr to them, the average prices of the preceding crop. By these prices, rents pay grain, and similar contracts, are generally determined; but the main obje convert into money the stipends (for the most part fixed at a certain quan grain) of the Scottish Clergy.

AVERAGE PRICE OF THE DIFFERENT KINDS OF GRAIN,

PER IMPERIAL QUARTER, SOLD AT THE FOLLOWING PLACES.

LONDON.

Date.	Wheat.		Barley.		Oats.		Rye.		Pease.		Beans.	
1857.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
Feb. 7.	60	8	43	11	23	9	34	0	39	10	38	6
14.	59	10	47	7	25	5	36	6	41	7	37	3
21.	56	6	45	11	24	0	39	6	39	10	36	8
28.	59	5	48	10	24	10	39	2	39	7	37	0
Mar. 7.	58	11	46	4	23	1	40	9	39	6	35	7
14.	61	4	49	1	26	0	39	8	42	9	36	11
21.	61	4	49	11	24	10	38	0	41	0	36	5
28.	59	1	51	5	24	8	36	6	38	11	36	11
April 4.	59	2	46	7	23	11	35	6	38	5	37	3
11.	59	5	47	0	26	2	38	7	38	2	34	11
18	56	5	46	11	25	1	35	7	39	1	36	2
25.	58	0	44	10	21	1	35	10	38	4	35	6
May 2.	58	1	40	9	21	8	38	10	39	7	37	7
9.	58	4	46	9	21	8	40	2	38	8	39	0
16.	60	4	44	10	24	9	36	0	40	9	38	7
23	65	7	41	5	25	6	34	0	40	2	41	1
30.	60	4	45	10	23	11	38	0	41	2	40	3

EDINBURGH.

Date.	Wheat.		Barley.		Oats.		Pease.		Beans.	
1857.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
Feb. 4.	39	11	35	2	24	5	36	9	37	11
11.	40	6	37	9	26	0	36	7	37	8
18.	41	7	36	4	27	4	39	6	40	1
25.	40	6	38	4	28	11	41	9	42	6
Mar. 4.	41	7	37	6	29	8	43	6	44	5
11.	41	10	37	2	27	11	40	4	40	10
18.	43	6	40	2	28	5	39	4	39	11
25.	43	8	40	4	27	7	38	6	39	3
April 1.	39	6	39	2	26	3	40	8	41	2
8.	36	8	37	0	27	1	38	9	39	4
15.	38	5	37	9	27	3	38	0	38	7
22.	40	4	39	9	29	1	40	8	41	0
29.	43	8	39	7	29	5	40	10	41	5
May 6.	45	1	39	0	29	1	42	6	43	1
13.	45	9	39	5	29	6	44	6	45	3
20.	47	6	38	1	29	7	44	4	44	10
27.	47	6	37	0	30	10	43	8	44	4

LIVERPOOL.

Date.	Wheat.		Barley.		Oats.		Rye.		Pease.		Beans.	
1857.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
Feb. 7.	58	2	45	11	22	3	40	6	38	6	43	10
14.	56	5	44	10	24	0	42	10	39	10	42	10
21.	55	10	44	4	23	0	40	8	41	0	42	8
28.	56	10	44	6	22	4	37	8	41	4	41	1
Mar. 7.	56	5	45	5	22	4	38	10	41	5	40	9
14.	56	9	37	0	23	10	40	3	40	6	42	6
21.	56	9	44	0	23	8	39	10	43	2	42	0
28.	54	8	36	8	22	6	38	8	39	10	42	0
April 4.	56	11	34	6	21	11	37	6	38	6	40	10
11.	55	5	36	4	24	1	36	8	39	4	42	3
18.	55	3	37	0	23	3	36	3	40	9	43	2
25.	56	2	37	10	23	6	37	5	43	1	44	0
May 2.	57	4	36	0	23	10	42	4	42	4	42	9
9.	59	10	37	9	21	9	41	6	40	8	44	2
16.	61	0	36	6	24	3	40	5	38	0	44	6
23.	69	10	36	3	24	1	39	6	39	4	46	10
30.	62	9	37	8	24	10	38	10	40	4	46	9

DUBLIN.

Date.	Wheat, p. barl. 20 st.		Barley, p. barl. 16 st.		Bere, p. barl. 17 st.		Oats, p. barl. 14 st.		Flour, p. bar. 9 st.	
1857.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
Feb. 6.	32	3	22	3	16	10	12	7	25	4
13.	31	9	22	0	16	4	12	3	20	6
20.	32	5	22	2	16	0	12	2	23	6
27.	32	2	24	9	16	8	12	0	24	6
Mar. 6.	32	4	23	6	16	4	12	4	24	0
13	32	0	21	11	15	10	12	3	23	9
20.	31	10	23	0	16	3	13	10	23	6
27.	31	8	22	10	16	1	13	8	23	5
April 3.	31	10	23	0	16	8	13	1	23	4
10.	31	8	22	6	15	11	13	2	23	2
17.	32	0	21	4	15	6	13	0	23	1
24.	32	4	23	0	15	10	14	5	23	3
May 1.	35	2	23	2	16	6	16	9	23	9
8.	35	1	23	4	16	10	16	6	24	0
15.	35	11	25	10	17	5	16	1	23	10
22.	36	2	26	9	18	4	16	4	24	2
29.	36	0	26	6	18	6	16	2	24	3

TABLE SHOWING THE WEEKLY AVERAGE PRICE OF GRAIN,

Made up in terms of 7th and 8th Geo. IV., c. 58, and 9th and 10th Vict., c. 22. On and after 1st February 1849, the Duty payable on FOREIGN CORN imported is 1s. per quarter, and on Flour or Meal 4½d. for every cwt.

Date.	Wheat. Weekly Average.		Wheat. Aggregate Average.		Barley. Weekly Average.		Barley. Aggregate Average.		Oats. Weekly Average.		Oats. Aggregate Average.		Rye. Weekly Average.		Rye. Aggregate Average.		Pease. Weekly Average.		Pease. Aggregate Average.		Beans. Weekly Average.		Beans. Aggregate Average.	
1857.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
Feb. 7. ……	56	6	58	3	45	9	45	6	23	0	23	5	39	3	38	10	38	10	39	8	39	6	40	8
14. ……	56	5	58	0	44	11	45	7	23	6	23	5	44	4	39	8	39	7	39	6	39	6	40	4
21. ……	55	10	57	6	45	4	45	8	22	10	23	3	37	7	39	6	39	3	39	5	39	8	40	0
28. ……	55	5	56	10	45	3	45	7	23	8	23	4	39	1	39	4	39	5	39	4	38	11	39	9
Mar. 7. ……	55	4	56	3	45	8	45	7	22	8	23	2	41	8	40	0	39	4	39	4	39	4	39	7
14. ……	55	6	55	10	46	1	45	6	24	4	23	4	39	10	40	4	39	7	39	4	39	4	39	5
21. ……	55	10	55	9	46	8	45	8	24	4	23	7	38	10	40	3	39	2	39	5	39	8	39	5
28. ……	55	6	55	7	47	1	46	0	23	7	23	7	40	9	39	8	38	6	39	2	39	6	39	6
April 4. ……	54	8	55	5	47	3	46	4	23	6	23	8	37	8	39	8	39	1	39	2	39	8	39	5
11. ……	53	11	55	2	45	9	46	5	24		23	9	38	9	39	7	38	5	39	0	39	10	39	7
18. ……	53	0	54	9	44	7	46	3	23		23	11	36	3	38	8	39	4	39	0	40	0	39	8
25. ……	53	2	54	4	43	7	45	10	22	9	23	8	35	9	38	0	39	3	39	0	39	8	39	8
May 2. ……	54	3	54	1	43	4	45	3	23	3	23	6	44	4	37	3	39	4	39	0	39	11	39	9
9. ……	55	10	54	2	43	5	44	8	23	3	23	5	41	5	37	4	39	9	39	2	41	5	40	1
16. ……	57	5	54	7	43	6	44	0	24	9	23	7	41	6	38	0	40	10	39	6	42	6	40	7
23. ……	57	9	55	3	42	8	43	6	24	11	23	9	39	7	38	2	42	3	40	2	43	8	41	2
30. ……	57	8	56	0	41	10	43	1	25	3	24	0	40	9	38	11	42	0	40	7	44	8	42	0

FOREIGN MARKETS.—Per Imperial Quarter, free on board.

Date.	Markets.	Wheat.	Barley.	Oats.	Rye.	Pease.	Beans.
1857.		s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s.
Feb.	Danzig	48 6 - 55 0	29 6 - 38 0	15 6 - 23 0	32 6 - 38 0	33 0 - 38 6	32 0 - 36
March		50 6 - 60 0	30 6 - 37 6	16 0 - 22 6	30 6 - 36 0	32 0 - 38 0	30 0 - 35
April		52 3 - 62 0	31 6 - 37 0	16 6 - 22 0	30 0 - 35 0	31 6 - 38 0	30 0 - 33
May		51 6 - 59 6	28 6 - 36 0	15 6 - 21 6	30 6 - 38 0	33 0 - 39 0	30 6 - 34
Feb.	Hamburg	50 6 - 56 0	32 0 - 39 0	13 6 - 18 6	32 6 - 37 6	32 0 - 35 6	28 6 - 36
March		49 6 - 55 6	33 6 - 41 6	14 6 - 19 0	31 6 - 36 0	32 6 - 36 0	29 9 - 37
April		48 3 - 54 0	30 6 - 34 6	15 6 - 21 0	30 6 - 35 0	33 0 - 37 6	30 0 - 38
May		43 6 - 59 6	31 6 - 36 6	16 0 - 23 9	33 6 - 37 0	34 0 - 39 6	31 6 - 38
Feb.	Bremen	50 6 - 60 0	31 6 - 30 6	13 0 - 20 0	31 6 - 38 0	25 6 - 36 9	24 6 - 32
March		48 6 - 56 0	30 0 - 38 6	12 6 - 20 0	30 6 - 36 6	25 0 - 35 0	26 6 - 34
April		46 6 - 54 6	30 6 - 38 6	12 6 - 19 6	30 0 - 35 6	26 6 - 37 6	28 0 - 37
May		48 0 - 57 6	29 0 - 36 6	13 6 - 22 6	32 0 - 37 6	28 0 - 38 0	30 0 - 38
Feb.	Königsberg	52 6 - 60 0	30 6 - 36 6	13 6 - 20 6	30 6 - 37 0	30 6 - 36 0	25 6 - 32
March		54 6 - 64 0	31 6 - 38 0	14 6 - 22 0	29 6 - 35 0	32 6 - 38 0	27 6 - 34
April		50 6 - 58 0	30 0 - 35 6	12 6 - 19 6	30 6 - 36 6	32 0 - 37 6	28 6 - 36
May		48 6 - 55 0	29 6 - 35 0	13 6 - 20 0	31 6 - 38 0	31 6 - 38 0	30 0 - 37

Freights from the Baltic, from 2s. 6d. to 4s. 6d.; from the Mediterranean, 6s. to 9s.; and by steamer from Hamburg, 3s. to 5s. per imperial qr.

THE REVENUE.—From 31st December to 31st March 1857.

	Quarters ending March 31.		Increase.	Decrease.	Years ending March 31.		Increase.	Decrease.
	1856.	1857.			1856.	1857.		
	£	£	£	£	£	£	£	£
Customs	5,540,132	5,243,600	..	296,532	23,034,029	23,321,843	287,814	..
Excise	2,807,000	2,898,000	91,000	..	17,311,152	18,165,000	853,848	..
Stamps	1,801,540	1,905,477	103,937	..	7,076,010	7,372,209	296,199	..
Taxes	249,000	260,020	11,020	..	3,100,031	3,116,046	16,015	..
Post-Office ..	760,152	777,000	16,848	..	2,777,152	2,886,000	108,848	..
Miscellaneous	468,843	492,569	123,726	..	1,439,664	1,383,030	..	56,63[illegible]
Property Tax	6,880,971	6,942,483	61,512	..	15,070,958	16,089,934	1,018,976	..
Total Income	18,507,638	18,519,149	408,043	296,532	69,808,996	72,334,062	2,581,700	56,63[illegible]
	Deduct decrease....		296,532		Deduct decrease....		56,634	
	Increase on the qr...		111,511		Increase on the year		2,525,066	

PRICES OF BUTCHER-MEAT.—Per Stone of 14 Pounds.

Date.	LONDON.		LIVERPOOL.		NEWCASTLE.		EDINBURGH.		GLASGOW.	
	Beef.	Mutton.	Beef.	Mutton.	Beef.	Mutton.	Beef.	Mutton.	Beef.	Mutton.
1857.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d
Feb. ..	7 6 - 8 9	8 6 9 9	6 6 - 8 0	6 6 - 8 9	6 9 - 8 9	6 9 9 0	6 9 - 8 9	6 9 - 8 9	6 9 - 8 9	6 9 - 8 [illegible]
March	8 0 - 9 0	8 9 10 6	6 9 - 8 6	6 9 - 8 9	6 6 - 8 6	7 6 10 6	6 9 - 9 0	7 3 - 9 3	6 9 - 9 0	7 0 - 9 [illegible]
April	8 6 - 9 3	8 3 10 3	6 6 - 8 3	7 0 - 9 0	6 6 - 8 3	7 3 10 0	7 0 - 9 3	7 0 - 9 0	7 0 - 9 3	7 3 - 9 [illegible]
May ..	7 0 - 8 6	8 0 10 0	6 9 - 8 6	7 6 - 9 3	6 9 - 8 6	7 3 9 6	7 0 - 8 9	7 3 - 9 0	7 3 - 9 3	7 6 - 9 [illegible]

PRICES OF ENGLISH AND SCOTCH WOOL.—Per Stone of 14 Pounds.

ENGLISH.	s. d. s. d.	SCOTCH.	s. d. s. d.
Merino,	22 0 to 29 0	Leicester Hogg,	21 6 to 26 0
.. in grease,	18 6 ,, 23 0	.. Ewe and Hogg,	18 6 ,, 24 0
South-Down,	21 0 ,, 26 0	Cheviot, white,	17 6 ,, 22 6
Half-Bred,	16 6 ,, 22 0	.. laid, washed,	11 0 ,, 15 6
Leicester Hogg,	18 6 ,, 25 6	.. .. unwashed,	9 0 ,, 13 0
.. Ewe and Hogg,	16 6 ,, 22 6	Moor, white,	8 6 ,, 11 6
Locks,	9 0 ,, 12 6	.. laid, washed,	6 6 ,, 9 6
Moor,	7 6 ,, 9 0	.. .. unwashed,	5 6 ,, 7 6

ON THE POSSESSION OF LAND AS AN INDUSTRIAL OCCUPATION FOR THE PEOPLE.

By the Rev. David Esdaile.

In the July number of this Journal we had an opportunity of indicating several of the personal and social benefits resulting from the possession or occupation of property in land by various classes of the people. The importance of the subject at all times, and especially at present, induces us to recur to it, with the view of pointing out the beneficial application of the principles we have advocated, and of removing the scruples and objections of those with whom we have the misfortune to differ in opinion as to the importance of giving a greater and more easily acquired interest in landed property to a larger number of the community.

The importance of the subject, in a political point of view, can hardly be exaggerated. In every country it is of vital moment that a large proportion of the population shall have an interest in the soil; and that this interest, whether that of actual possession or of limited occupancy for purposes of tillage, shall be easily, expeditiously, and cheaply transferable, as the circumstances of proprietors or tenants may demand. If few be personally interested in the ownership or cultivation of the land, an unnaturally strong impulse is given to the national mind to seek employment in professional pursuits, in trade and commerce, and in every variety of ingenious handicraft. Hence a frightful surplus of needy people, with all the average faculties of human beings—their brains not water-gruel nor their fingers pipe-clay—longing, moreover, for something to do, but not able to find it; and this in a world where God has given "to every man his work!" Of a truth we have ourselves to blame for what we suffer. Labourers, not seldom, driven to desperation, to rick-burning and sedition, because no one has hired them, as in England; famine looking out of the sunken eyes of the peasantry, filling their hearts with dreadful thoughts, as in Ireland; mechanics and mill-girls on strike—the last blanket, the Bible, and the wedding-ring pawned as a last resource—an often-witnessed misery in the manufacturing districts;* a constantly growing difficulty among the educated classes in disposing of their children; a harder fight for a position in society among lawyers, doctors, and divines. Where is all this to end? Whither are we drifting?

And then that grand phenomenon of our times, the townward movement of our population—50,000 persons yearly added to the ,000,000 of London, 9000 to Glasgow, 8000 to Manchester, and to other towns in nearly like proportions—accompanied, of course,

* Report of Poor Law Commissioners on the state of Stockport, 1842.

by a corresponding diminution in the numbers of those inł the country or interested in agriculture; so that, as the lasi nial census declares, within the last half-century the propo land to each inhabitant of Great Britain has fallen from to 2.* Who will say that this is not a great fact, and ı have no reason to regard it with uneasiness? The enter trade, and the vast operations of our world-embracing coı have all a growing tendency to divert us more and more fı primitive occupation of the human race,

"When Adam delved and Eve span."

We believe that this is the inevitable result of advancing tion; we are, moreover, persuaded that this is not all pure be deplored and struggled against with all the energies national will. We always make a large deduction from the lavished, very inconsiderately often, upon "the good old ı and, in order to bring them back again, we are not in tl disposed to aid the projects of a visionary writer, who ex "Stop the gambling speculations of our manufactures, an off the surplus population from our towns into the countr landlords plant colonies on their commons and bogs and mı —plant them under their own eye, upon right principles nisation—in organic bodies, with powers of self-governme social privileges, with the germs of village institutions, es with that first principle of social life and organisation—an ecclesiastical establishment in the centre. Restore some the feudal spirit into our tenure of land. Raze, if you lik ground, half an overgrown metropolis, and all the idle, gı gaping watering-places, where those men who ought to be their own parishes ruling their estates, as the representa the great estate, the monarchy of the realm, are fritterir time, money, and dignity and intellect, in frivolous dissipa

* The same phenomenon is being exhibited in France, whose populati ours in that respect, may be said, taken collectively, to have been almost during the last ten years. But though nearly stationary in amount, the from the rural districts to the towns has been most remarkable. Thus, t ment of the Seine, in which Paris is situated, has gained no less than 300 in the space of five years, having risen from 1,422,065 souls in 1851 to 1, 1856; or, in other words, the metropolis has gained in this short period 50 bitants more than the total increase of population in the rest of France. *burgh Review* for April last, commenting upon this singular fact, observes man who quits his native village by the high-road to Paris, leaves behin better part of his nature, and, above all, those qualities which make him a ject. He exchanges the modest existence, the regular but certain employ the strict economy of rural life, for the more exciting, precarious, and co town labour. He will never revert to the humble, persevering, and invalua his rural condition." And yet this writer, who is so acute in discerning France from such a state of matters, has not a word to bestow upon a simil happily less imminent, jeopardy to the people of Great Britain! He is ı unconscious of its existence.

† *Quarterly Review*, September 1840.

But though in this fashion we are not prepared to pare down to reasonable dimensions our great towns, which some regard as so many ugly and hurtful excrescences on the otherwise lovely face of our mother earth, we heartily go along with the same writer when thus exhorting us: "Let us endeavour to occupy our own waste lands. Millions of acres are still unreclaimed, both in Great Britain and Ireland." On the impolicy of becoming more and more dependent on foreign nations for the supply of food to our rapidly-augmenting population, we largely dwelt in our previous paper. We referred to the 14,304,000 acres of British and Irish soil capable of improvement. We pointed out several remarkable instances of successful reclamation of what statistical writers denominate "waste land." And in regard to 15,871,463 acres characterised as "unprofitable," we showed, from the successful operations on Blair-Drummond moss in Perthshire, and on the trembling bog of Chat moss near Manchester, that it may be possible to enlarge the operations of British agriculture, and to gratify the universally diffused desire for property in land, without interfering with the present system of large properties and extensive farms. We think, it is true, that this system has been carried so far as to lead to serious embarrassment. How can it be otherwise when the numbers of the people living in the country are annually reduced? when cottages are thrown down in every direction, and matrimony rendered more and more impossible, because those disposed to obey the primeval command, "replenish the earth," can find no nuptial-chamber, however lowly? when ploughmen and their families are overcoming their aversion to emigration, and sailing by thousands to Canada, and even to Australia? We who live in the country are feeling the inevitable results. We know a farm belonging to a cottage-destroying proprietor, the operations on which have been so retarded by the diminished supply of labour, that in the beginning of August the turnips were not "singled." We hear of farmers grumbling at the excessive rise in ploughmen's wages; we see this summer a greater anxiety as to the means of securing the harvest, as may be easily understood when women are demanding more than 20s. per week and their food. We think that landlords and farmers are blind to their own interests in following a system leading to such results; and in order to divert them from it, we have dwelt on the benefit to be derived from a greater number of the people having a personal interest in the land. Political economists, with their stereotyped phrases as to the tendency of small properties to engender pauperism and reduce the national supply of food, may alarm bookworms and theorists ignorant of actual results; we must believe our own eyes. What we have seen in Belgium is not a dream; what we have read in the works of such writers as Thornton, Laing, and Mill, is not mere sentimentalism and special pleading. They detail

incontrovertible facts. If our readers desire more acquai with these than is to be found in our previous article, let peruse an excellent paper on the social and political influe small holdings published in this Journal in 1849. We confi anticipate that the result will be to persuade many that v not in error when maintaining that a reasonable proport little properties, of small farms, and of good crofts, is essen the existence of a right state of matters in this kingdom.

To bring men to believe this, and to act upon their beli the great object contemplated in our previous arguments an trations. In order to lubricate some men's throats, and them easily to swallow doctrines which they dislike, and to them comfortably, undismayed by dread of hearing the olc lutionary cry, "War to the castle—peace to the cottage," w been at pains to demonstrate that subsisting arrangement not be overturned; because, so capacious is the bosom of M Earth, that within it are provided food and shelter for a children. We are persuaded that this earth of ours is so ar by Providence that its productiveness has a wise and m relation to the number of its inhabitants; so that if we dul ourselves of divinely-made arrangements, it shall not dwelling-place of scanty numbers, perpetually haunted dread of famine, but of happy multitudes, finding in their g magnitude no fear of over-population, but rather new sou individual happiness and national strength. But this happ not to be found in deserting the country and congregat million-peopled cities—those graves of the human race death every year reaps a double harvest and men l live but half their days—the life of a Londoner in the parts of the metropolis being on the average only seventeen The eminent surgeon, Sir Antony Carlisle, has stated tha the father and mother were both town-bred, the family end the third generation.*

Who, then, can wonder at the annual migration of towns the country, and at the man chained to the desk and the groaning out in the vernacular, if not in Latin—

"O rus, quando te aspiciam!"

It is an instinctive effort at self-preservation—a gasping f life. We do well then, we conceive, when writing up possession of land as an industrial occupation for the peop we think we show a proper respect for Solomon's declaratic "wisdom dwells with prudence," when, declining extrem as to the desirableness of more of our population being pro of land, we point out how our desires may be accomplish

* See an able paper in the *The Zoist*, No. 17.

so very alarming or sudden change in subsisting arrangements. If we fail in convincing landlords that it is not their interest that cultivated land shall be in few hands, we fall back upon an impregnable position when asserting that it is to the benefit of nobody, but to the signal loss of individuals, as well of the community, that millions of acres shall remain uncultivated when their profitable cultivation is known to be possible, when eager crowds are longing for permission to bring them within the domain of industry, and when eleemosynary support and food from foreign shores are among the number of our well-known national necessities. We are saying nothing new; we are repeating already reiterated facts and arguments; but neglected truths must be pressed upon the attention of those who can think, and of those who have the power of acting upon their conviction of what is for the public good. And, therefore, we not only present this important subject under the aspects under which it appears to our mind—we refer to the facts and reasonings of others; and in order that the readers of this Journal may not fancy that we are advocating novelties heretofore overlooked in its pages, we refer to what we find in the volume for 1847: "We have lifted up our feeble voice—would it were trumpet-tongued—to rouse the Legislature from their apathy, that they might feel the importance of the subject, and enact a law for the cultivation of waste lands, so that the present scandal to the rulers, and cruelty to our suffering poor, should cease to be a disgrace to this magnificent country. We could now point out tracts of rich uncultivated land, within forty miles of the metropolis, as wild and pathless as they were when the turf yielded to the hoof of the highwayman's horse; and now that men have congregated, and hamlets are seated in midst of these wastes, their inhabitants wade ankle-deep in mud. To one such spot, if a stranger were suddenly conveyed, he would suppose himself hundreds of miles from London. These are 'Crown lands,' and they are jewels, though as yet in the rough, worthy to be so called; beautiful as the other gems of the royal diadem, and as useless, too, to the community."

A few years ago there was a very profitable agitation regarding the abuse in the management of Her Majesty's Woods and Forests; and if that were renewed with increased vigour, and with a general reference to Crown Lands, we are very sure that the result would be immensely beneficial. Our respect for the powers that be is sorely tried by some of their doings. We notice one especially cruel and impolitic proceeding. In the heat of the recent war with Russia a large number of labourers was induced to accept Government employment at Woolwich dockyard and arsenal. By their strenuous exertions the war department was greatly assisted in its efforts to provide for the exigencies of the struggle in which we were engaged. Justice required that these

should be remembered on the advent of peace, but routin "No;" and that simple dismissal was the rule in such ı Hundreds, skilled in the labours of a vitally-important publ partment, were therefore at once dismissed without an atte render their services available in case of the occurrence of a ı emergency. Reduced to dependence on day's wages which not be speedily found, these distressed artificers and lab petitioned that the War Office would be pleased to aid the to remove to Canada. They at first received an official re the usual style, "regretting," and all that sort of thing; afterwards Government did give some assistance to their ex tion as an auxiliary to a public subscription in their behalf. ing this at the time of its occurrence, we could not help ex ing, "How foolish to send these men to Canada as agricul when they could so speedily and cheaply be formed into a cultural colony at home, by being made the possessors of s those hundreds of thousands of acres, over the non-cultiva which philanthropy has been lamenting! Suppose us ag war, where shall we find men to replace those who have g Canada? Fine encouragement this to patriotism!" This p business, demonstrating that certain folk cannot look more day or two before them, occurred last April. We are in that 1020 men, women, and children, have been "transpl to Canada, and about 50 to Australia, at an expense of while for others employment has been found in England. A in August we are at war with the swarming hordes of Chi with the bloodthirsty and fanatical millions of Hindostan, an the prospect of being embroiled with other nations willing advantage of us in our time of need; the recruiting serg using all his bellicose blandishments to induce our rustics to don the plough for the sword; harvest is demanding t strength of the rural population, in order that we may sec labours of the husbandman; and we are required to me strain on our national resources at a time when emigratio vigorous operation among the agricultural classes, because a they cannot gratify their wish to have a personal interest soil of their native land. We think it utter madness to co apathetic under such circumstances; we deem it the duty true patriots to encourage our people to remain at home by ating the wish of many to become connected with prop and; we look upon the doings of Government, in dismis Canada valuable and much-needed labourers, as most vorthy and pernicious. But what better can be expecte espectable organs of public opinion write in this thoughtle egarding a man out of employment: "By far the cheap providing for him is to ship him off to a colony where la ... where the means of living are abundant

expense of *transplantation*—we use this word to avoid '*transportation*'—would be very moderate; and we are perfectly satisfied that the results would be more pleasant and profitable than anything which has taken place for many years in our political system." * "Pleasant and profitable" to have harvests that can hardly be reaped, ships that can hardly be manned, and regiments so few in number that we must have mercenaries to fight our battles; millions of acres of British territory

"That bud and lavish gold"

in the lovely but useless form of the blossoms of the furze and the broom, when they might teem with abundance, and resound with the bleating of sheep and the lowing of oxen! Such is the pleasure, and such the profit of loosening home-ties and setting our population adrift to seek their fortunes! Such is the benefit to the State of listening to the political philosophy of those who "transplant" the British oak to foreign shores, instead of allowing it to take firm root in "Her Majesty's Woods and Forests," there in its natural *habitat* to bring forth fruit after its kind!

We shall give another specimen of Government deliquency in the matter of waste land. It is furnished by the Registrar-General's last quarterly return of births, marriages, and deaths. "Many districts of the country still suffer from marsh malaria. Thus, in the marshy districts the mortality is raised from 17—the natural rate—to 24 in 1000, chiefly in consequence of the noxious emanations from a rich ill-drained soil. Sheppey may be taken as a type of these districts. Sheerness should be immediately drained and supplied with pure water. As a Government fund affords very proper facilities for the loan of money, drainage should be made compulsory on the owners of the land in districts which are so fatal to the inhabitants, more particularly when the naval force of the country is seriously impaired by this standing insalubrity. It is evident that a large portion of our naval reserve may be paralysed by ague and fever at the very time that it may be called on to fight. A force which lives in an aguish atmosphere is necessarily enervated, and loses some of its courage. It cannot be always ready to meet the enemies of England at the gates of the Thames and the Medway."

So, then, this land question is one of life and death in various ways. Permit millions of acres to remain "waste," and hundreds of thousands of the very pith of our population annually leave us in search of lands in distant climes. And these waste lands waste the lives of soldiers and sailors; ay, and of the church militant also, we sorrowfully assure the writer in the *Church of England Quarterly Review*. Many a good and faithful soldier of the Cap-

* *Church of England Quarterly Review*, April 1857.

tain of our salvation languishes in Lincolnshire, and other fenny lands of England, and of Scotland, and Ireland too. As a remedy for all these evils, some of which may at once be removed, we say, Occupy the soil, apportion it in such quantity as may suit the wishes of the many desirous to be proprietors of land; let them plough, dig, and drain it. Malaria will vanish, rheumatism will not torture and prematurely stiffen so many rustic loins and limbs; the wilderness, overgrown with useless vegetation, will gleam with the nodding ears of ripened grain; and troops of lusty peasant children will be reared in cottages on the reclaimed heath and mountain-side; and from them we shall have a vigorous race to till our soil, recruit our armies, man our fleets, and supply constant accessions of mental and physical energy in compensation of the exhaustion of life and strength in our great cities.

We intended giving only one illustration of Government delinquency in the matter of waste lands. But while we write, there is put into our hands another public document, supplying a new illustration of the impolicy of not taking vigorous steps to open up the soil of the British empire for the occupation of the people. We have lying before us the Report of Commissioners appointed to inquire into the management of Crown Lands in Canada. It reveals a system of peculation, plunder, and pillage pursued by most of the officers occupying the important position of Crown Lands Agents for the Upper Provinces. Of 168,900 acres advertised at the agency in Huron, under condition of actual settlement by the purchaser, it appears that 58,655 acres fell into the hands of non-resident speculators, among whom were all sorts of citizens of Toronto, and even *cabmen*, well-known residents therein! Whereupon the Report observes: "We passed near large blocks of the finest and most fertile lands in Canada, yet remaining in their primeval state, the abode of the bear and beaver, inviting the energy and industry of the people, but shut out from that energy and industry by the cupidity of heartless speculators, who, in violation of every principle of good government, have locked up for their own gain what was intended for the heritage of the whole people, the strength of the Government, and the prosperity of the colony. In some places we found perhaps three or four settlers, before whose stout hearts and strong arms the native forest thicket had yielded 'openings' to light and vegetation, still separated by miles upon miles of dense 'bush' from other three or four settlers similarly situated—no roads for ingress or egress, social intercourse cut off, ignorant of the passing events of the day, and all hope of churches for their own instruction, and of schools for the instruction of their children, for many years cut off. What mind, not wholly steeled against every feeling of philanthropy, that would not sympathise with them in their isolated and 'cut off' condition, fail to exert its energies for the amelioration of that condition?

Labour is said to be the true foundation of the wealth and greatness of nations. To procure labour the country must possess labourers. Can that man be a friend to his country who would willingly see it shut up in large wilderness blocks, until it may suit the cupidity of the land speculators to part with them."

We quote this because, with a little modification, it is a wonderfully correct picture of matters at home. These "cut off" dwellers in the bush—churchless, schoolless, and rarely gladdened by the sight of a fellow-creature bringing tidings from the busy world outside the horizon of the forest—surely we have their prototypes in the old country;"—in "back-lying" localities, with a ridiculously small population, drenched with bog-water, and doggedly jogging on in what Bacon calls "the easy way of ancient mistakings." Those peculating land-agents,—we have a dim recollection of parallel plunder of her Majesty's Woods and Forests, brought to light, moreover, by a Commission of Inquiry demanded by the Legislature, just as in Canada. "Blocks of land" exhibiting manifest indications of latent fertility,—them too we have abundantly kept out of the hands of longing multitudes, not, indeed, by greedy speculation, but by national folly and want of private enterprise. Human nature, it seems, is the same on both sides of the Atlantic—

> "Cœlum, non animum, mutant, qui trans mare currunt,
> Strenua nos exercet inertia: navibus atque
> Quadrigis petimus bene vivere. Quod petis, hic est;"

which is Horace's pithy way of telling us that rascality is common everywhere; that we are a lazy set; that we glory in yachts, and coaches and four, and see not the wealth which lies at our door; so that Lackland is the patronymic of an amazingly large portion of her Majesty's subjects, not because there is a scarcity of standing room on the face of the earth, but because, as we shall demonstrate by-and-by, the law of our land is against the law of nature, and has thrown innumerable artificial obstacles in the way of becoming either proprietors or tillers of the soil.

We wish it to be otherwise; we have been showing the impolicy of expatriating those who wish to labour at home. We shall now indicate some other modes of bringing under profitable cultivation those huge blocks of land, the desolate condition of which is a standing reproach and an unspeakable disadvantage.

Formerly we treated our criminals most irrationally, condemning them to enforced labour of the most unprofitable kind, and treating them with a barbarous severity. Nowadays all manner of benevolent absurdity is perpetrated in the management of "the dangerous classes." Our prisons are popularly known as "Rogues' Hotels,"—"owre gude for blackguards like me, sir," as a convict once candidly told us. Instead of hard work being the main

feature of prison life, the moral and the intellectual are inc nately attended to; and at the end of a few months' or years' comfortable detention, the chaplain and the teacher are expe to send forth to the world new men and women. We all k the result. However sincere and thorough the reformation convict, very few believe in it. He has the greatest difficult living honestly, and of course has a vivid recollection of the fac with which he eased a fat lady of her well-filled purse, w struggling through a crowd at a flower-show in the Crystal Pal We cannot wonder then, that, instead of wearing out his spirit tr to get some honest employment, he falls back upon the e acquired wages of iniquity, and becomes a doubly-hardened de dator. He returns to prison, to undergo another course o called "discipline," the result of which is a new demonstratio the old saying, "evil communications corrupt good mann Again thrown loose upon society, which this "jail-bird" has learned to look upon as an appointed prey, he is still more fitted for honest industry. His double conviction is a double in the way of being trusted; and as the State makes no provi in the way of employment or emigration for convicts w periods of detention have expired, he necessarily falls into old course of crime. In short, penal discipline, unconnected any systematic mode of disposing of liberated convicts, is l more than a very expensive way of providing rogues with b and lodging at the public cost, and in a style fitted to excite envy of many an honest and hard-working labouring man. not to be wondered at that such a system should excite comn and disapproval, and that the frightful expense of our crim law, coupled with its confessedly unsatisfactory results, sh have prompted the attempt to devise a remedy. It is fo many think, in making prison labour profitable to an am hitherto unknown, by directing it to the cultivation of the Select the most youthful and vigorous convicts, form them agricultural colonists of districts most needing improvement, f them to perform with regularity the average work of a labou man, until the money value of it bear a reasonable proportio the sum expended by the State on the detection and punishm of their crimes, and there is reason for anticipating a sen diminution in the prison-rates, as well as in the number of cr nals. When organisation of labour is in so many instances kn to be profitable—where the principle of co-operation, applie agriculture, is that which hinders the ruin of communities so surdly or wickedly constituted as those of Shakers, Rapp and Mormons—we are not unreasonably sanguine in our ex ation of great public good from the penal pursuit of agricul In voluntary associations the difficulty is to discover the mea ndu[illegible] their members to labour their share. A convict

munity of agriculturists, such as we are supposing, feels this difficulty less than any other. The strong arm of the law reduces it to perhaps the nearest approach to a *minimum*, and it is by means of two very powerful though most opposite principles—namely, fear of punishment and love of liberty. Laziness may lead to a dungeon and bread and water, while industry will wipe off the debt the prisoner owes to society; which will look on him less suspiciously and unkindly when aware that he has paid the last farthing exacted in compensation of the wrong to the community. If honest men earn their bread by voluntary toil, we hold it most reasonable that rogues should be made to sweat gold ere they be allowed to pass the prison gates. Bar it inexorably till they can open it with a key of silver, which they themselves have extracted from the earth; until they have a sum of money sufficient to maintain themselves until a field of honest enterprise has presented itself after their liberation. Let there be no jail delivery, and we are much disposed to believe that prisons and reformatories would become self-supporting institutions, and cease to be nurseries of crime, the retreats of pampered vagabonds, whose disinclination to industry led to fraud, pillage, and murder. Laziness is the great law-breaker. Therefore, demonstrate to all the roguishly inclined that crime leads to hard work as well as loss of liberty, and you do more than can be effected by all the labours of the county police. Even a very lazy thief being made to understand that the pursuit of crime has a decided and almost inevitable tendency to land him in prison where work he must, he will arrive at the conclusion, that since they who will not work shall not eat, it will be advisable, upon the whole, to labour as a freeman rather than as a prison slave; for, disguise it as we may under such names as "detention," "discipline," "reformation," and such like, imprisonment is, or ought to be, slavery—temporary or perpetual. The propriety of turning this kind of slavery to such use as shall at once benefit the public and the prisoner, is becoming more and more a subject of inquiry and experiment. The principles of obliging the convict to buy his liberation by the price of his toil is carried into most successful operation in the great prison at Munich; of which we have an interesting account in the recently published work of Mr Matthew Hill. In this country its application to reformatories, *many of which have considerable portions of land attached to them*, is attracting deserved attention. We would urge on the movement in this direction. The reports published by these industrial schools and reformatories are important, because demonstrating that a hitherto unmanageable portion of the community may find beneficial occupation more or less connected with the soil, which they cultivate as penal farms or gardens.

But while thus indicating enforced labour as one means of en-

larging the area of our cultivated land, we by no means desire that the sweets of rural life shall be enjoyed only as the result of rascality. We desiderate more employment, rural or semi-rural, for the honest workman. We advise an alliance between the mill and the field; we would put the spade into hands accustomed to the shuttle; in short, we would unite agriculture with manufactures, so far as such union is practicable.

Let us see what may be done in this direction. In our previous article we alluded to the reports of the Labourers' Friend Society, and gave examples of the signal benefit to the artisans in the midland counties of England, who through the medium of this society had been enabled to employ their leisure in the cultivation of cottage gardens containing a rood, or 1210 square yards. It is most satisfactory to find that, by careful management, so small a plot of ground will supply poor people with vegetables all the year, besides enabling them to keep a pig; and that the agents of this society continued to express their lively sense of the good, physical and moral, to the manufacturing operative from his being induced to spend his leisure in the garden rather than in the beer-shop or the gin-palace.

This is an obvious remedy for the sloth and misery of the forty or fifty thousand male adults yearly turned adrift by the improvements in machinery, which is constantly becoming more *automatic*, so as only to need the superintendence of young women or children. Thus, out of 424,209 operatives employed in the manufacture of cotton, wool, worsted, flax, and silk, only 96,752 were males above 18 years of age; 130,218 were females above 18, and 114,603 were females below 18.* It thus too often happens that the head of a family engaged in manufactures is a lazy fellow in the prime of life, who does nothing, and lives on the labour of his youthful sons and daughters employed in the mill, whose kindly feelings towards their parent are destroyed by his selfishness. As they maintain him, they despise his advice or control, and leaving his house, which to them is so little of a *home*, they form new connections, and mercilessly abandon him to the care of the parish. If men thus deprived of the means of support were enabled to employ themselves on a little piece of ground in the vicinity of the place where their families are engaged as artisans and mill-workers, they would still be the heads of their own houses, and be saved from the degradation of sordid dependence on their reluctant children. There, then, is a way of allying the mill with the field, to the extent at least of making our operatives field-gardeners; a change to them useful and agreeable—gardening, according to the learned Soyer, being "the luxury of agriculture."

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* Factory Commissioners' Report.

There is a special branch of manufacture which we would particularly desire to see courting an alliance with agriculture. We mean that of the hand-loom weavers, whose frequent misery makes them objects of compassion. We recommend them, in all possible cases, to abandon their thankless toil as their sole means of living, and to endeavour to improve their condition by combining field-gardening with application to the loom. In the United Kingdom it is computed that there are 800,000 weavers; and the average wages of the great body of them are from 4s. to 7s. 6d. per week.* And yet these poor people not only cling to their ruined trade, but train their children to follow it, owing to the facility with which it is acquired, and the immediate benefit derivable from the united labour of their youthful families. Thus from shortsighted selfishness and unreflecting ignorance, or, it may be, from the desperation of bewildered misery, they entail upon their offspring a humiliating penury which might have been avoided. This folly is perpetuated, because they who know better what is going on in the world take little interest in the working classes, and allow them unheeded to go on "spending their strength for nought and in vain," instead of pointing out the propriety of turning their labour to better account, and rousing them from their listlessness by the offer of friendly aid, as well as judicious counsel. If all clergymen and landholders were thus to befriend weavers in their vicinity, we should not long be pained by witnessing children consigned by their parents to a hopeless struggle with an ever-increasing poverty. We hear much of the intelligence of the weavers. Their conduct affords but slender evidence of their possessing it. "There must," as Mr Symons truly observes,† "always be a worst paid trade, and weaving is naturally that trade." And yet the man who knows this practically adheres to this trade with ruinous pertinacity, and loudly laments that while he labours so hard he is paid so little. But we would remind him that "he works with no more energy than the Hindoo, and yet expects a common share of the produce of the most energetic nation in the world. The real calamity of his lot is, that he has never known what true labour is; for if we seriously compare it with the other efforts of the human beings around us, it is an abuse of words to call the jerking of a stick from side to side, with a few other uniform motions, by the name of labour. A machine does it, and a machine ought to do it—men were made for higher, more intricate, more daring tasks."‡ Harshly said, rather, but perfectly true. Weavers in other countries have not been so slow in perceiving that it is neither manly nor reasonable

* At present they are considerably higher, but this does not sensibly affect our general statement referring to a series of years.

† *Arts and Artisans.*

‡ BURTON'S *Political and Social Economy.*

to expect a comfortable subsistence from such a style of labour, carried on in mad competition with the giant power of steam. The high education of the Swiss soon taught them that a handicraft, at least so far as plain-weaving is concerned, requiring the skill of children and the strength of women, must necessarily be remunerated by the wages of women and children. In Switzerland, therefore, weaving, except in fancy-work, has ceased to be a separate employment, and is the occupation of children, women, and elderly men; adults resorting to it only during the intervals in the pursuits of higher industry. The loom, which is here an exclusive and semi-starving occupation, is there a pastime of supplementary production. "But," observes Mr Symons, "it must be remarked that were the sort of out-door labour performed by the Swiss artisans the same as that of English labourers on arable farms, instead of being chiefly horticultural or pastoral, as in Switzerland, it is questionable whether the hands inured to the plough, the flail, and the pitch-fork, would be fitted for the weaving of muslins and ginghams for amusement."

This difficulty is not likely to occur under the system of employment which we would recommend to the British weaver. We do not contemplate that he shall be engaged in the delicate manipulation of muslin-weaving. Neither is he to be converted into a ploughman: we merely propose that he shall be the holder of a piece of land varying from one to two acres, and which he may dig 18 inches deep in twenty-five or fifty days. This amount of hard work, being accomplished during the intervals of his weaving, is not likely to prove too severe or to impair the nicety of his touch, and give him "the horny palm" of the labouring man. Mr Symons calculates that an amount of comfort equal to that of the Swiss weaver could not in this country be procured for less than 30s. a-week. A British weaver able to expend the half of this sum weekly would not be the half-starved and in every way ill-conditioned man he often is; and with the example of the Swiss before him, it becomes him to inquire whether, by a new application of his industry and intelligence, he may not be brought into something like so desirable a condition. It must be confessed that we know instances in which this union of weaving with agricultural labour fails to produce the charming picture of the Swiss peasant artisan, with his happy countenance and hardy frame, his roomy and well-furnished house, his ample means, and excellent clothing. We know many weavers occupying small pieces of land, and whose houses, early and late, resound with the clack of the shuttle; but we see in them few traces of Swiss cleanliness, content, and plenty. Their houses are hovels, ill roofed, floored very rarely with wood, generally with coarse, ill-set stone, and not seldom with beaten earth, damp and full of hollows. Their food is of the humblest

kind—meal and potatoes; and with very little attention to economy, they have the greatest difficulty in paying their rents.

But while our rural weaver's physical condition is thus confessedly inferior to that of his Swiss competitor, we do not think it hopeless to try to raise him from the slough of despond into which he has allowed himself to fall. Let landholders reflect, that by exacting unreasonable rents from their weaver tenants, they are only rearing men who, after a miserable struggle, must sink into pauperism, and they will see it to be their interest to grant them small holdings at a less exorbitant rent, and to hold out encouragement to their being cultivated in a superior manner. The holders of such allotments must also bear in mind that, in the instances of failure above referred to, this was owing to gross mismanagement. They are sometimes cultivated by horse labour principally. Managed thus, they are necessarily unremunerating. Only the surface of the soil is stirred; manure is wasted as well as scantily applied; and the stinted produce barely suffices to pay the labour-bill, and to maintain the family on the verge of destitution. Suppose the horse discarded, according to the rhyming advice of Martin Doyle, in his "Hints to Small Farmers"—

> "Let little farmers mind their spades,
> Nor think of keeping four-legged jades;
> The proverb long ago decides
> Which way a mounted beggar rides."

Let all assistance requiring to be paid for be resolutely declined, and let the whole tillage be performed by the weaver and his family. His land will be deeply stirred, and as free from weeds as a well-kept market-garden; and if enriched by liquid manure and nightsoil, carefully accumulated, as in Belgium, and added to the manure produced by the pig, it will certainly prove a source of permanent profit, which will materially assist the scanty earnings derivable from attention to the loom during bad weather and the long nights of winter.

Some of our readers may object that it is all very well to theorise about the combining of weaving with agriculture, and that what we have said about the result of this combination in Switzerland is all very fine, but that it would be much more to the point were we to exhibit such a happy combination nearer home. Well, we have candidly said that we know many instances in which the union of the shuttle with the plough, or the spade, is productive of a hard struggle for mere existence. But we invite our readers to follow us into Yorkshire, and to inspect the dwellings of the rural cloth-workers of Saddleworth. In its heathery hills and deep valleys, dividing the woollen from the cotton cities, we find a hardy, industrious, and primitive race, engaged in the manufacture of flannel and cloth, sometimes in mills, and sometimes by their

own hearths. In the latter case, the business of a dairy farmer is often added to that of a manufacturer, and the same hands ply the shuttle and milk the cows. The eye wanders over clumps of oak, and through straggling woods of sombre fir—from cottage to cottage, from hamlet to hamlet, and mill to mill, the former often perched high upon the hills, where the green of the pasture begins to give place to the brown sterility of moss and moor, and the latter invariably nestled in the very bottom of the glen, each beside its lakelet of clear water, dammed up from the rapid stream of the Thame. All around—hill and glen, oak coppice, green pasture, and heathy ridge—is Saddleworth. We have thus sketched the locality because of its resemblance to many a spot on Scottish soil. As an illustration of what the union of farming with weaving may lead to in this country, under certain circumstances not of rare occurrence among us, we avail ourselves of the intelligent labours of the "Special Correspondents" of the *Morning Chronicle*, whose communications regarding Labour and the Poor, published in 1850, are full of the most interesting and important details bearing upon the condition of the people. Here is the account of a cluster of old houses called Saddleworth-fold: "They are occupied by several families, who are at once spinners, weavers, and farmers. The hamlet was a curious irregular clump of old-fashioned houses, looking as if they had been flung accidentally together up and down a little group of knolls. Over the small latticed windows were carved mullions of stone, and in a little garden grew a few box-wood trees clipped into the quaint shapes which we associate with French and Dutch gardening. The man whose house we had come to see, was a splendid specimen of humanity—tall, stalwart, with a grip like a vice, and a back upright as a pump bolt, although he was between 70 and 80 years of age. The principal room of his house was a chamber which a novelist would love to paint, so thoroughly yet comfortably old-fashioned, with its nice sanded floor, its great rough beams hung with goodly flitches of bacon, its quaint latticed windows, its high mantel-piece, reaching almost to the roof, over the roaring coal fire; its ancient, yet strong and substantial furniture; the chest of drawers and cupboards of polished oak, and the chairs so low-seated and so high-backed. In this room the whole family, journeymen and all, took their meals together. Porridge and milk was the usual breakfast. For dinner they had potatoes and bacon, or sometimes beef, with plenty of oat bread; and for supper "butter-cake," or porridge again. The old man had never travelled farther than Derby. He had thought of going to London once, but his heart failed him. He did not at all approve of the new-fangled mill system, and liked the old-fashioned way of joining farming and weaving much better. In the room [illegible] were two or three looms and as many spinning-jennies.

They produced flannel and doeskin. Weaving and spinning formed the chief occupation of his family. They attended to the cows, of which he had four, and to the dairy in their leisure time. He paid his sons no regular wages, but gave them board, lodging, and clothing, and a trifle of money if they wanted to go to a hunt, or a fair, or "sooch loike." At another place, painted not quite so much *couleur de rose*, in answer to the question whether dear bread and bad trade always came together, this reply was given: "I never knowed it otherwise. Look, sir, when everything to eat was terrible dear two years ago, what happened to us? Why, we could get no work at no price, and all the weavers hereabouts that hadn't farms were forced to turn out, and work at the tunnel under Stannidge. If it wasn't for *that*, I don't know what would ha becoom of us."

So, then, to witness a realisation of our views as to the benefit to our depressed weaver derivable from the union of farming with weaving, we have only to take a few hours' ride on the rail; and in Yorkshire we shall make acquaintance with families of farming weavers not very far removed in point of comfort from those which, perched on the mountain-sides of Switzerland, call forth the admiration of the passing tourist and the inquiring traveller. It is the utter dissociation of our manufacturing from our agricultural interests that has so thoroughly changed the aspect of our country, and the domestic habits of the people, as well as effected the most important politico-economical results to the nation. If we are bent upon such ultra utilitarianism as only to think of pounds, shillings, and pence, possibly our present system may give the quickest possible circulation to the largest amount of the coin of the realm. But if the health and home happiness of the people enter into our calculations, we shall find it politic in the highest degree to foster instead of repressing man's natural desire to live in the country, and to till the soil. If we were mere politicians desirous to populate the earth, rather than "possess and subdue" that portion of it where God has assigned us the place of our dwelling—it might be quite right to preach up emigration to all and sundry, and to inspire our people with the profound conviction that he was a wise old heathen who taught that our country should be wherever we are comfortable—

"*Ubi bene, ibi patria.*"

But as we are not yet arrived at this heartless "philosophy falsely so called," we would give our people every opportunity of acquiring rural homes; in which happy mothers may teach multitudinous children to sing the pretty part song,—

"All among the barley, who would not be blythe
When the free and happy barley is smiling on the scythe?"

and in which fathers might have patriotism enough to say with Béranger,

> "*Mes amis, mes amis,*
> *Soyons de notre patrie;*"

or, in plain English—

> "There's no place like home!
> An exile from home splendour dazzles in vain,
> Oh! give me my lowly-built cottage again."

Having thus indicated the benefits to various orders of the people derivable from the possession or occupation of property in land, we shall now briefly advert to the objections of those who constantly refer to the social condition of France and Ireland, as supplying invincible demonstration of the impolicy of the views we have been advocating. Their constant cry is, look to France, look to Ireland! We have done so literally as well as figuratively; and our opinions have been formed from personal observation, as well as from reading. We are not advocating the abolition of the law of primogeniture; we have no wish to introduce that excessive subdivision of the soil resulting from such abolition in France. We pray objectors to remember, that if we can prove that, even with such drawbacks, the possession of land is a desirable industrial employment for the people, then much more may it be expected so to be in a country where such drawbacks are unknown. The evidence as to France is conflicting. We lately read a fierce French denunciation of the small property system as an invention for rearing millions of starving democrats. Although disposed to let the French speak for themselves regarding their own affairs, we put this aside on account of its political bias, and seek for the truth in the regions of high philosophy. In the *Comptes Rendus* for 1848, M. Moreau communicated to the Institute these highly interesting statistics of French agriculture: "The gross annual revenue of our agriculture is now double what it was under the Empire, only one generation ago; it is three times as much as it was in the time of Louis XIV. There is not another example on record of such rapid progress in agriculture, and of the acquisition of such great riches, the fruits of labour, of intelligence, and of the happy effects of public liberty. The agricultural wealth of France has advanced within the period alluded to, from 1,500,000,000 francs, or 77 francs to each inhabitant, to 7,502,905,000, or 224 francs to each inhabitant."

If any of our readers fancy that this report to the Institute of France may have been "cooked so as to look well," we adduce the independent testimony of an intelligent American. "Few things," observes Mr Colman, in his *European Agriculture*, "have struck me more forcibly than the difference in the agricultural population of France and that of Great Britain.

I have never seen a more healthy, a better clad, or a happier population than the French peasantry. I am extremely averse to making any unfavourable comparisons, and I am quite aware that my judgment may be at fault; but I shall offend no candid mind by the calm expression of my honest opinion. The very poor condition of a large portion of the English labouring population must be acknowledged. *The acquisition of property is all but impossible.* The great difficulty where there is a family is to subsist. In sickness they have no resource but private charity or parish assistance; and they have, in most cases, nothing to which they can look but the almshouse." This is too true. Surely, then, it becomes us to inquire whether the evils which oppress us do not originate in the total dependence of such a vast proportion of our people on fluctuating daily wages. So far as the possession of land by the mass of our population is concerned, we have deviated further from the normal condition of the human race than any of the European kingdoms. In France, for example, there are twenty millions of persons so far connected with landed property as to be independent of the wages of labour, while in Britain there are only about two hundred thousand, or about a sixtieth of the population.* We invite attention to these details regarding the comparative condition of the people in France and England. As to the former country, it seems incontestible that the much-dreaded and decried *morcellement* of the land is somehow not so miserable in its results as we should be apt to apprehend, and that the French, upon the whole, corroborate rather than contradict the general law, that in every well-governed country the possession of land is advantageous to the people.

But the cry used to be, "Look to Ireland, and see what may be expected from too minute subdivision of the land." Every one knowing anything of that unhappy country is aware of the unheard-of condition of the people in connection with land. The Irish peasant, however, is not wretched *because* he is a *holder of land*, but because of the peculiar manner in which he holds it; because the rent is extortionate, and because, very often, he is deplorably ignorant, and incurably lazy. When visiting Ireland about twelve years ago, we found turnips cultivated only in the northern part of the country; and if in the southern counties an attempt had been made to enlighten *Pat* in the mystery of their production, by sending him a Scotch agriculturist, the preliminary colloquy would probably have been something in this fashion: "If you please, Pat, did you ever see turnips growing in a field?" "None of your Scotch blarney," says Pat; "I know the'll grow in a garden if it's warm, but my father had a cousin who tried them in a field, and sure one trial sarved him."

* ALISON's *Principles of Population*, vol. ii. p. 48.

Unpromising as Ireland may seem as a field for the smal system, which notoriously has been its curse, "Facts from dore, compiled from notes by Lord George Hill," open up a future for that unhappy land, now that famine, pestilenc emigration have swept away so many of the miserable cre who fancied that the possession of a plot of potato-groun enough to insure their independence. In order to strength belief that in the *proper cultivation of the soil* there is a reme even Irish misery, we select a few "facts." Tullaghobegly, c Donegal, was, in 1837, one of the most miserable districts i land. Its population of nearly 9000 souls possessed 1 c plough, 16 harrows (often made fast to the *tails* of the por 8 saddles, 2 pillions, 11 bridles, 20 shovels, 32 rakes, 7 forks, 93 chairs, 243 stools, 2 feather beds, 8 chaff beds; no hogs, or pigs; 27 geese, 3 turkeys; no bonnets, no spurs, no trees nor vegetables of any kind, save cabbages and pot None of the women had more than one shift, and most of none. "Whole families of sons and daughters, of matur lay together indiscriminately with their parents, and all in bare buff." No rent was paid sometimes for a period of twenty years; the wretched Rundale system was in full fo all were smugglers, all were starving. A bold heart trul Lord George Hill to settle down amongst such savages i hope of civilising them. He not only made the attemp succeeded marvellously. His premiums for the encouragem industry were not competed for till after several years, fo people could not believe that a gentleman could be so great as give his money for nothing, and no doubt thought them very knowing in not being taken in. He persevered, ho and his triumph is thus recorded by the London Irish Pea Improvement Society: "*Now* we behold in all direction and comfortable cottages, attracting the eye by their well-th roofs and whitewashed walls, giving an aspect of life, healt cheerfulness. Nor were we disappointed on a closer inspe we found that the interior of the houses fully realised the tations raised by their exterior appearance—clean, orderl well-ventilated rooms, comfortable and suitable bedsteads, supply of clothing and furniture equal at least to the wa the inmates, and in many instances showing a taste in the ar ments for which we were quite unprepared."

All this happened many years before the improved socia dition of Ireland drew forth those congratulations which appeared in the most recent numbers of the "Edinburgh the "Quarterly." W... opportunity of ascertaining wl those literary organs g... due meed of praise to the self- ... benevolence of ... George Hill. All honour to hi ... of Ireland,

has already proceeded so far as to justify the belief that the foundations of Irish prosperity have at length been securely laid. It is especially to be noted that this has been effected by improved modes of owning and occupying the soil. The excessive multiplication of farms, so small as not to yield subsistence to their wretched occupants, has been corrected ; a revolution in the social habits of the people has been accomplished by the very means from the use of which we should have anticipated such happy changes. Lands, mortgaged and burdened in modes the most varied and disastrous, have been transferred to new owners by a cheap and expeditious legal process. Pauper cottiers, not laborious cultivators, but wretched squatters, rendered reckless by misery, have been succeeded by a race deserving to be called farmers; men not content to feed on potatoes, and live in a hut, compared with which the wigwam of the North American Indian is decent and comfortable, but conscious that they possess farms sufficiently large to reward their toil, and furnish them with not a few of the comforts of civilised existence. We argue that Ireland is in this happy case because its people are, to a very great extent, in the possession or occupation of its fertile soil, and because recent legislation has brought about that occupation of the land which we maintain is best for a nation's weal. Old families and wealthy capitalists are owners of great properties, while, at the same time, the instinctive desire of the human mind to be connected with property in land, is gratified by the existence of an adequate proportion of smaller rents, and of tenants occupying farms of various extent. Instead, therefore, of turning away from, we confidently "look to Ireland," in corroboration of our views on the possession of land as an industrial occupation for the people. The grand difficulty in the way of the realisation of these views is the absurd, unjust, and perfectly unintelligible state of the law. This is a matter of such vital importance to the nation at large, and to owners of land in particular, that we must reserve it for separate consideration in a future article, in which we shall make our readers acquainted with the newly published "Report of the Commissioners appointed to consider the subject of the Registration of Title in reference to the Sale and Transfer of Land."

NORTH AMERICA: ITS AGRICULTURE AND CLIMATE.*

America has been a fruitful source of authorship. Its aborigines have furnished materials for the volumes of the novelist, and subjects of discussion to the ethnologist; the peculiarities of language and manners of its present inhabitants have been the ready butt for the ridicule of a Trollop and a Dickens. Its natural productions have been the cause of many a toilsome journey to the enthusiastic naturalist, and contributed no little to the value of the works of an Audubon. Its very bowels have been ransacked, investigated, and written upon by a chief among geologists; a Johnston has favoured us with his Notes on its agricultural, economical, and social state, replete with information and interest. Its political constitution is an everyday theme with authors; and a practical farmer of Scotland has recently given us the results of his observations on its agriculture and meteorology.

Mr Russell is well known for his devotion to meteorology, and its application to agriculture. When chemists disputed as to the best theory by which to explain apparent inconsistencies in agriculture, Mr Russell reminded them of an important element which they had forgot in their calculations and discussions—viz., climate. He showed that, however feasible some of these theories were in particular climates and seasons, they failed when applied in others quite different. Consistently with his views, he offered an explanation of many facts which otherwise were quite irreconcilable. It was not to be expected, then, that one who had devoted so much attention to meteorology would lose the opportunity afforded him, by a visit to America, of improving his knowledge of it. Indeed, he tells us that one of his main objects in visiting that country was to study its climate; and the results of his observations and studies he threw together in the form of lectures, which he delivered at the Smithsonian Institution in Washington. The substance of these lectures forms an important part of the volume before us, in which he fearlessly "explains the laws which regulate the climate of North America," according to his own peculiar views, though these are at variance with those held by some of the highest authorities in the science of meteorology.

Throughout the whole of the agricultural portion of his book, Mr Russell shows the particular bias of his mind—his fondness for meteorology as applied to agriculture. We could easily fancy, as he rattled along in the cars, visited farms, walked over fields, and listened to the observations of the settlers, an under-current of thought passing through his mind, whilst it busied itself with recording agricultural facts with his meteorological observations.

* [illegible] Russell, Kil[illegible]iss.

Indeed, if we are inclined to find fault with Mr Russell, it is in this very circumstance, that his too great attention to the relations of meteorology to agriculture has made him, perhaps, neglectful of recording in his work many details in the agriculture of America which we would have expected from a practical farmer, and which would, at the same time, have been most useful.

As several interesting chapters from Mr Russell's work have already appeared in this Journal, we think it unnecessary to introduce again any long extracts from it, as what has appeared is sufficient to give an idea of his style. Accompanying the text is a map of the States through which he passed in his travels, on which Mr Russell has been at considerable trouble in delineating with differently coloured lines the districts in which wheat, Indian corn, cotton, sugar, &c. are principally cultivated. It is, in short, an agricultural map, and a most valuable one, as showing to his readers, be they emigrants or others, at a glance, the regions devoted at present to the cultivation of these different crops. In our following remarks we shall take this map as our guide.

Looking at the map, we find that the country about and north of New York to Montreal, and from that line east to the sea—in fact, all the sea border of the northern part of the United States—is what Mr Russell calls the Granitic Region. Sad must have been his disappointment as he surveyed the country about Boston, the first American town he took up his abode in, for the soil all around was nothing else than a poor, sandy, granitic drift, and frequently bare rocks with polished surfaces were all that met the eye. "Between Marshfield and Boston, a distance of thirty-six miles, the soil is so miserably poor that little of it is fit for cultivation. Large boulders are thickly imbedded in it everywhere, and yet I was told this was good land, and in good condition." We are not surprised at Mr Russell considering "the agriculture of this part of America by no means interesting to one from the old country." Bad, however, as the soil is, it appears to be well adapted for the growth of apple-trees, which bore most abundant crops. Crushed bones are found a most beneficial application for fruit-trees. "The farms are small, and the offices are usually under one roof. At Braintree, about six miles from Boston, they formed a high building of three stories, with the hay in the upper, the cattle in the middle, and the manure in the under. The foundations were dug out of a sloping bank, and the floor of the upper story was level with the ground on the outside. There is a great scarcity of straw in the New England States, and the cattle and horses lie on boards for the purpose of economising it." On his visit to the hilly districts, the appearance of the country was not more promising. Near Mount Washington, the highest mountain in the United States east of the Mississippi, the country is only partially cultivated. A good many small farms were seen; but it was evident that the occupants must have some other source than

farming, from which they derive their subsistence. " The soil peared destitute of vegetable mould, and no fields were seen with granite boulders sticking out on the withered pastures."

It must have been cheering to forsake this barren waste ascend some of the mountains in the hill districts, which are ge ally covered with wood to a considerable height—Mount Washi ton, for instance, to a height of 4500 feet. And so great appear have been the change in the vigour of the vegetation in the uncle portions of the district, that Mr Russell was " struck with the wan luxuriance of nature, not so much shown in the size of the tim as in the number of trees which the soil was supporting." " soil and climate of New England are particularly genial to the gro of timber, and it appears to be a peculiarity of the primary soils h that the pine, the elm, the maple, the beech, and the spruce, grow gether in social equality. We give the particulars of a farm in N England, visited by Mr Russell, in the neighbourhood of Newbu " It consisted of 700 acres, 500 of which lay back on the hills, were wholly under pasture; of the 200 acres in the valley, some acres were in Indian corn, 35 in oats, and 10 in potatoes, the mainder in pasture and hay. It seems to pay much better to g the land than to plough much of it. The richest meadows here overflowed every spring when the snows melt on the White Mc tains. These meadows yield about 3 tons of hay, and are w 100 dollars per acre. When the original turf is broken up, i long before the grass becomes so good as it was originally. cording to the season, from 50 to 95 bushels of Indian corn per are got from the best lands, while the ordinary sandy or grav land in this valley does not produce more than from 30 to 40. crop is cultivated in ridges 3 feet wide; some 4 or 5 grains of are planted on the ridges at a distance of 2 feet. Towards the la end of its growth it is slightly earthed up. The farm offices sisted of a huge building 250 feet by 45, another 250 feet by and two 70 feet by 20. There were stalls for feeding 70 cattle, 150 could be wintered in the yards. The cattle get an allowanc Indian-corn meal when feeding on hay. It is considered good ment if they yield 10s. a-month for their keep."

In summing up his observations on New England, Mr Ru says: " The soil is the poorest I could imagine capable of b cultivated. It is nonsense to talk of the land being exhausted vidently there never was anything to exhaust. Gravels and s ull of huge boulders, are the characteristics of what goes under ame of improved lands, in the schedule of the census commiss In my travels through New England I saw hundreds of a ultivation, and Mr Horace Greely assured me he knew of t ds, over which one might almost step from one large boulde ther, without even touching the soil. I did not see a si hich could be ranked higher than a fourth-rate one eithe

the Lothians or in my own county of Fife; yet after I had completed my tour, I was told I had seen an average." And yet, notwithstanding the poverty of the soil, we are told that land sells for building-sites, even at the distance of ten miles from Boston, for from £200 to £300 an acre. And agricultural societies have been established since the end of the last century, by which great progress has been made in rural improvements, and an unproductive soil quickened into activity by the application of skill and capital to it. These are just the effects of that relation which subsists among the great interests in every country, and in this instance between agriculture and commerce. All the towns on the sea-board of the district which we have been considering, are indebted for their prosperity to their commerce. As the outlets for the produce of a country which could boast of nothing but its magnificent forests, with splendid harbours, the inhabitants of these towns betook themselves at first to ship-building, and exporting their timber to the Old World, for which they received back what was wanted by colonists in the interior. Being thus the medium of barter between the people of different countries, they soon amassed wealth, which was liberally spent in improving the appearance of the neighbourhoods of their towns, and the agriculture of their country.

Referring again to the map, we find the Wheat Region commencing from Quebec in a narrow strip up the St Lawrence, and expanding out to a considerable width about Lakes Ontario and Erie, then stretching west to the prairies, extending to the north half-way up Lake Michigan, and to the south, into the north part of Indiana. Another tract of it diverges from Lake Ontario south through New York and Pennsylvania. A considerable portion farther south may be said to be neutral ground between wheat and Indian corn, where the regions proper to these plants interlap one another. The cultivation of wheat, according to the plan laid down by Mr Russell, which is quite in accordance with what has been stated by other writers, occupies no great extent of the American continent.

The farms in the wheat region extend, on an average, to from one hundred and fifty to three hundred acres. The farmers live comfortably, all the members of the family having generally their allotted duties to perform; the men being always employed in the fields, and the women always confining their labours to domestic occupations. The American women in the free States are not to be found working in the fields as ours do here. At all diets butcher-meat forms a principal dish. The soil is not such as comes up to our ideas of good wheat soils. They are divided by Mr Russell into three classes:—1. Sandy loams; 2. Gravel soils; 3. Soils resting on the boulder clay. "These latter are by no means rich in vegetable mould, but have a fine healthy red tinge, derived from the oxide of iron, which the eye of practical men look upon as being associated with something that promotes healthy growth of every crop that is

cultivated." It will be observed that the general character of the wheat soils in America is light, which is the reverse of that attached to the soils adapted for the growth of wheat in this country. Mr Russell very reasonably attributes the difference of character to climate.

The farmers in this district, indeed throughout the whole country, are obliged to adopt such systems of farming as their present circumstances will admit of. The principal drawback to the practising of the improved systems of agriculture prevalent in this country is the want of labour. We would have liked if Mr Russell had given us fuller information on the price of labour in the different districts of the free States through which he passed. It would certainly have made his book more useful to emigrants, for whom we consider it a valuable help, particularly in his descriptions of the climate and the soil. In the celebrated Genessee district, the practice followed is to grow wheat and red clover alternately; for the clover grows as luxuriantly on the light soils there as it does in our carse lands here. We are told, as the opinion of an intelligent farmer in that district, that the clover would last from ten to fifteen years on these soils, if it was always cut early in the season, and not allowed to run to seed. The wheat is sown very early in autumn, and the clover amongst it in spring. Very few cattle are kept; and the clover is regarded more as a crop for green manuring than for fodder. Any benefit derived from it in this latter respect must be before June, for in that month they begin to plough it up. So much value do they put upon it for green manuring, that in some of the leases a clause is inserted prohibiting the tenants to pasture it till the 1st of June, by which time it has attained to a considerable growth, and cannot be pastured long, as about that time they begin to plough it up. After the clover is ploughed down by a deep furrow, the land is worked by the harrow and the scarifier to destroy the weeds. This is what is called fallowing the lands. No other manure is used but a dressing of gypsum in spring, when the clover is sown among the wheat; the effect of this manuring is said to be most surprising. As the best paying crop is wheat, and labour is scarce and expensive, it will readily be seen that a cheaper and simpler method of raising a fair crop of wheat could not be practised in that district. From one-third to one-half of the arable land of the farm is thus annually in wheat, which is obtained at little expenditure of labour; as some farmers alleged that two men and six horses would cultivate 100 acres of land, and thresh the produce and take it to market.

Other systems of culture of wheat are followed in those districts not quite so fertile as that of the Genessee. In Michigan, wheat and Indian corn are grown alternately; immediately after the Indian corn [illegible] the ground is harrowed and the seed-wheat cast on the ground [illegible] harrowed in; no more cultivation is deemed necessary. A [illegible] wheat will in a short time, be seen

amongst the stubble of the Indian corn, which is about seven or eight inches high. Sometimes the land is kept in clover for two or three years, and when turned up, is sown with Indian corn and then wheat. We have often been led to look upon the prairies as the future great wheat-producing district of America. Mr Russell, however, informs us that the soil there, which is of a very loose character, containing a good deal of vegetable matter, is not, on that account, well adapted for the sowing of autumn wheat, which the high winds and the intense frosts of winter are very apt to destroy, and the frosts and thaws of spring are liable to throw out. The wheat here also has a great tendency to mildew. We will simply allude again to the character of the American wheat soils, which is very light; bare sand, with very little vegetable matter intermixed in some districts, so much so that, to all appearance, it might be mixed with lime for mortar; and yet Mr Russell was informed that the soil, for twenty feet deep, would produce first-rate crops of wheat and potatoes without any manure.

In Canada, the system practised of growing wheat is sometimes the same as that followed in the Genessee district: but it is the more general practice to allow the land to remain for two or three years in pasture. After this it is ploughed up, sown with rape in spring, which is eaten off with sheep; and the land prepared and sown with wheat in autumn. Manure, we are told, has not the effect of increasing the yield of wheat in Canada and the States so much as with us; and the wheat should always be sown early to prevent rust and mildew. Some of the Canadian states are also troubled with a great agricultural pest—the wheat-midge, which has committed such ravages on the crops in the flats of the St Lawrence, and in New Brunswick and Nova Scotia, as almost to cause the discontinuance of the cultivation of wheat, or, at all events, reduce it very much. "In Lower Canada, New Brunswick, Nova Scotia, on the whole, the soils are very poor; and the wheat soils occupy only a small area in the two latter States, for even on the best farms there is rarely more than one-tenth of the arable land sown with this cereal."

The land is cultivated either by the landlords themselves, or it is let to tenants. When let, the land rents at from six to eight bushels of wheat per acre, but rent is paid only for what is in wheat. For what is planted with Indian corn a rent of from one to two dollars per acre is paid sometimes, but more frequently nothing at all, as in the case of clover; as both Indian corn and clover are looked upon more as preparative crops to wheat. The produce of wheat varies much; in Virginia it is sixteen bushels per acre; in Indiana and Kentucky, eighteen; in Canada, twenty; in Pennsylvania, twenty-five.

As Indian corn is now coming more into use in this country, a few remarks on its composition, the different varieties, and its cul-

ture, may not be uninteresting here. The high price of oats for some years back has induced many gentlemen who keep studs of hunters, farmers and others employing many horses, to try Indian corn, as in part a substitute for oats; and so far as we have heard, the experiments have given satisfaction. We may, however, warn those who have determined now to use this useful grain for oats, to take care that they get the proper variety, for in no grain is there such a difference of feeding quality as in the varieties of Indian corn. We are told by Professor Johnston that it "consists of a semi-transparent, hard, horny, or flinty part of a yellow colour, beneath a thin but double epidermis; within this, of a white, soft, opaque, starchy part; and within all at the base of the seed, of the germ, or *chit*, as it is called in America. The horny part consists of starch, oil which, under the microscope, can be seen in globules, and of a proportion of vegetable albumen. The soft, white, opaque part is chiefly starch, and the chit almost entirely albumen." Now, in the different varieties of Indian corn, the relative proportion of these different parts varies exceedingly, and consequently their feeding qualities also must vary. Thus in one kind where the horny part is large, the oil must be in greater abundance than in another variety where that part is not so large, and thus the feeding quality of any variety will be determined entirely by the predominance of one or other of the parts in the seed. Another fact worth mentioning is that which was communicated by Dr Jackson of Boston to Professor Johnston. It is, that the horny part of the corn is not digested by the horse, though it is readily digested by the pig and fowls.

The uses to which Indian corn, or maize, is put in America are the feeding of slaves, horses, cattle, pigs, and distillation. In some districts, as much as from 6 pounds to 18 pounds of Indian-corn meal are given to cattle per day. Two plans of feeding the hogs are adopted—the one is to turn them into the maize-fields six weeks before they are killed (which is done generally in the first week of November), to harden their flesh; the other plan is to enclose them on a piece of ground, and drive the maize-meal to them. They are never housed in summer, but roam at large in the woods and fields. In the great maize-growing region a large quantity of that grain is manufactured into spirits, Cincinnati being the great centre of this trade. The reason of applying this valuable grain to these purposes is its great abundance, the great expense of transporting it, and the want of a proper market for it in its natural state. Let there be but a demand for it in this country, and we will be swamped by it, for the supply of it from the Western States is unbounded.

The Indian-corn Region proper is situated to the south of the [illegible] region, occupies the centre of the United States, and extends [illegible] prairies in t[illegible]. This useful grain, however, grows

ly in most parts of the United States and the Canadas, and so al does it appear to be to the climate and soil of the New d as compared with wheat, that often in particular districts e not more than 18 bushels of wheat can be raised, 70 can be iced of Indian corn with the greatest ease. We find it, there- very much intermixed with wheat in the wheat region proper, ng, as we have shown above, a preparative crop for the latter. in the Genessee flats situated along the banks of the river in celebrated wheat district, it grows far more luxuriantly than t, the produce of which on these lands is most uncertain, vary- rom 18 to 40 bushels per acre, while from 70 to 90 bushels ie produce per acre of Indian corn. In fact, it is found more able to cultivate Indian corn on the rich lands than wheat; n such soils as in those of the Genessee flats where crops of can be cultivated for twenty years in succession, it is con- d advisable to reduce the fertility by cropping with maize e growing wheat.

e culture of Indian corn varies with the climate and the variety. and Kentucky are the great maize-producing States. The y usually cultivated there, is what is called Dent-corn, whose of growth admits of its being cultivated by means of horse r, thus economising the manual labour, which is the great ob- n to its cultivation in the Northern States where the Flint- is grown. The former is "planted in squares of three feet, or at is called check-rows by the Ohio farmers." The latter is cul- d in rows from 2½ to 3 feet apart, and the plants 1½ feet to 2 part in the rows. In Cuba, two crops of it are obtained in ear—a winter and summer one. In Louisiana again, the te is quite unfitted for its cultivation. Being hot and moist, ises this grain to grow to a great height with a comparatively roduce of grain, from 15 bushels to 25 per acre. In other s, however, to the north, the produce varies from 60 to 75 ls, and even as high as 90 bushels per acre in some very fertile as in the Genessee flats.

come now to detail a few particulars regarding those crops iich, as farmers, we are not so directly interested; we mean i, rice, and sugar. These are all cultivated in the Southern s. The cotton region is included in North and South Carolina, gia, Alabama, Mississippi, and Louisiana. The cultivation of arried on entirely by slave labour; and the soil on which it is ated varies much in fertility, from loose sand in which there y little vegetable matter, to the most fertile on the banks of vers. On the inferior soils the fine sea-island cotton is raised; he productive powers of the soil is stimulated by the addition of cow manure and vegetable matters from the swamps. o has also been tried with marked effect. "The cotton is ed in ridges 4½ feet in width, and 1½ feet between each

plant in the row. The cotton seeds are planted from the 20th March to 20th April, and as the plants rise, the soil is thrown up to their roots by the plough and the hoe. The seeds of the cotton plant, like those of pease and beans, ripen soonest on the branches next the ground; indeed, while the lower branches of the cotton plant have ripe seeds, the upper are bearing flowers. As the seeds ripen, the husks expand, and the cotton fibre appears attached to the seeds in the form of a round ball as large as an orange. As soon as the earliest husks are open, which is usually about the last of July, picking commences. This operation is long continued, for a succession of pods ripen until the end of November. As the cotton is gathered, it is dried and stored up till winter, when the separation of the fibre from the seed is effected. This is done by the operation called "ginning" by means of the treadle-gin for the sea-island or long staple variety, and Whitney's saw-gin for the short staple varieties. A great improvement has of late years been made in cotton gins by Mr Burn of Edinburgh, by which all kinds of cotton can be cleaned by the application of steam power, thus doing away with the treadle-gin, a more thorough separation made of the fibre from the seed, and the fibre being less injured than it the saw-gin of Whitney.*

It will readily be seen that a great deal of manual labour is required in the raising of the cotton plant and in the preparation of the fibre for market, and hence the number of slaves kept on the cotton plantations. Indeed, it would be next to impossible to cultivate cotton profitably with free labour in the present state of the labour-market in America. Mr Russell says "that a given number of slave population on the large-plantation system will produce, in the present circumstances of the country, a much greater quantity of cotton than the same number of free;" but to this we will refer afterwards. The climate materially influences the variety of cotton cultivated in a particular district. Thus in South Carolina where the frosts are severe, the plants have to be renewed every year, as they are destroyed by the frosts. Where, however, the frost is not so severe, the varieties of cotton cultivated are perennial. In the former case, it is usual to follow a fixed rotation, thus: 1. Cotton; 2. Indian corn; 3. Cotton; 4. Grasses and weeds for a series of years; or two crops of cotton and one of Indian corn are taken for a series of years, till the produce of both becomes so small that it is considered unprofitable to cultivate them, when the "land is abandoned to nature for a series of years" to recruit itself. The

* The proportion of seed to the fibre in the cotton plant is as 2 to 1, or, according to Mr Russell, 1500 lb. of seed cotton as it is picked from the husk, will yield 400 lb. of fibre, and 1100 lb. of seed. The seed is used for manure and food for cattle; some planters value it at £4 per ton for manure for Indian corn or cotton. Oil is also extracted from the seed, and this manufacture appears to be progressing if we may judge from the increased importation into this country of the refuse of the [illegible]

alue of the best cotton-plantations in Louisiana is about £4 per cre, which is little more than one-half of that which soils of similar uality are worth in Canada West. The reason of this comparatively ow value is that the soils are not adapted for pasturing. Indeed, Ir Russell mentions a curious fact about red and white clover rown in this region—viz. that stock cannot be grazed on them fter the beginning of May, as they have the effect of salivating the nimals. The red clover is in full bloom by the end of March. One f the great secrets of rendering a cotton plantation profitable is to row food for the slaves on it, their usual daily rations being ½lb. f bacon, Indian corn, and molasses. A considerable portion of the rofit is swallowed up, if these articles have to be purchased in the Northern States."

The land devoted to the cultivation of sugar, rice, and tobacco is ot of small extent, and all situated in the Southern States, a great art of which consists of poor sandy soil, which is little cultivated, ut is covered with vast forests of pine, and is thus called the Pine Barrens. "The soil of the pine barrens," we are told by Mr Russell, "belongs chiefly to the post-tertiary formation, which extends long the coast from Virginia to the south of Florida, and also long the northern shore of the Gulf of Mexico, as far as the Mississippi. The breadth of this formation is about 130 miles on an verage, and the soil of this immense area is of the poorest description, little of it being fit for cultivation. With the exception of he swamps and margins of the river, pines cover its whole extent nd furnish a considerable trade in timber, resin, tar, and pitch." Sugar and rice occupy the land along the banks of the rivers in his barren waste, and the soil is of better quality than that of the est of the barrens. In Louisiana, guano has been applied extensively to the sugar cane with great success, as it not only increases he yield of sugar, but also prolongs the life of the cane. The cane, is well known, is propagated by cuttings put into the ground in ows and at regular distances, and covered up with loose earth. They soon send out shoots, which grow most rapidly, reaching aturity in a few months, when they are cut down, and the sugar s pressed from them. In America the plant is seldom allowed to ast more than two years; but new rich land has the effect of prolonging the life of the plant—an effect produced by an application f guano also. We may therefore look for great competition in the uano market with the sugar-planters of America, to whom it is oing to be of immense benefit.

The rice grounds extend along the level banks of the river, from which canals are led traversing the country for some miles from the iver. These canals are furnished with sluices, and are the main runks by which, according to a regular system of irrigation, the ice-fields are flooded. The great expense attending the formation f the canals and drains for irrigation enhances the value of a rice-

plantation very much, which, combined with the number of slave necessary for its cultivation, necessitates the possession of a large capital per acre than land devoted to any other kind of crop. By some the ground in the rice-fields is ploughed every year, while th majority of planters do not think this extra labour necessary. Afte the stubble of the previous crop has been burnt, a rut is made witl a hoe or small drill-plough between the rows of the last crop; int which ruts the seed is dropped and harrowed in, or at once floode with water from the river. The water is drawn off whenever th young shoot appears above ground. In a week after the field i flooded, and the water allowed to remain for a time, varying fron ten to thirty days, the principal use of this water being to kill th land weeds. When aquatic plants appear, the water is again draw off; and after a time, about the beginning of July, it is readmitte and allowed to remain till within a day or two of the cutting of th crop, which is ready for this operation about the beginning of Sep tember. It is thus seen that one of the great advantages of th frequent watering is the economising of labour, saving in fact th expense of weeding with the hand.

The principal grazing districts of America are in Kentucky an Ohio, where large herds of cattle and mules are reared and fattene or exported to the other States. The climate and soil seem we adapted for producing good pasture, indeed a "fine blue gras which is valuable for pasture, grows spontaneously in Kentucky ar Ohio." Wheat and Indian corn are cultivated alternately, Indian corn alone, for a number of years on a piece of land, whic is then allowed to rest in pasture, when this blue grass spring up in great luxuriance, choking and destroying all other plants i the soil. After it has been in pasture some eight or nine year it is again subjected to a cropping with wheat and Indian corn before. The pasture and climate in these districts seem we adapted for the rearing of short-horns, some splendid specimens which Mr Russell saw exhibited at an agricultural show. Thoug the frost in the winter is most severe, the cattle are never house but roam about in the woods, where they are abundantly supplie with hay and unthreshed Indian corn as it is taken from the field An ox on grass is kept for one dollar a month. Mr Russell inforn us that the pastures in the prairies are not so valuable as we hav been led to suppose. The grass, when pastured by cattle and shee loses much of its previous vigour of growth. It is seldom read [illegible] the end of May, and it is quite burned up b [illegible]gust, [illegible] "it requires from 5 to 6 acres of dry natur prairie to support an ox." The natural grasses, after they have bee pastured for a time, gradually fall off, and a natural white clov [illegible] their place; and the practice is now becoming common whe [illegible] natural grasses decay, to sow timothy grass, which, when on [illegible] yields an abundant pasturage giving food from the first

lay to the first of December. Mr Russell has been led to the conlusion, from what he saw, that the prairies are far more profitable when producing Indian corn and oats than when pastured. Reapng-machines are in general use here, one of which had attached to t a threshing-machine which threshed and sacked the grain.

We cannot conclude these remarks without directing attention o the results of Mr Russell's observations on slavery in America nd Cuba. He tells us that one of the principal objects he had in isiting America was to satisfy himself as to the state of slavery here. And that he has accomplished that object, the full details e has given of this plague-spot in the American constitution, and he conclusions he has arrived at regarding it, bear testimony. The acts he has adduced, though not new, corroborate the statements of those who have written before on the subject, and possess increased value, as being told by an eyewitness of good powers of observation, and of an inquiring mind. From our foregoing remarks it will be seen that the crops usually cultivated in the Southern States, the strongholds of slavery—sugar, cotton, rice, obacco, and Indian corn—all require a great deal of manual labour. It is impossible, in present circumstances, to obtain that labour from freemen. For owing to the scarcity of free labourers at present, the characteristic indolence of the African race, the vast tracts of unoccupied land in America, and the incessant manual labour required by these crops, were there to be an immediate emancipation these crops would cease to be cultivated, and the Southern States would be for a time ruined; for whenever the negroes found hemselves free men, ignorant of the value of wages, and ambitious of being their own masters, they would squat down on some of the unoccupied lands; and finding that the labour of four or five hours a-day would give them a scanty subsistence, they would resign hemselves to their indolent habits and love of amusement, and refuse to work to a master. The proprietors of the Southern States are aware of this, and they see nothing but destruction to their properties, and ruin to themselves, if the negroes were emancipated at present. And hence the exasperation they manifest against the abolitionists. They have become more obstinate since witnessing he effects of emancipation in our colonies. In those of the West ndia Islands, where the population was abundant, the emancipation f the negroes was attended with little bad effects to the planters; ut in others which were thinly populated, as for instance in British Guiana, the effects were most disastrous; for not only were the olonists compelled to give high wages, but they could not get the eople to work for any money, and the abandonment of some of the nest estates in this colony to the rank vegetation of the bush was he result.

It would be well if the abolitionists would take into their consieration these words of Mr Russell: "Until the institution of

slavery be weakened, as it was in Europe, by the redundancy of the predial population, I have as little hope of slavery relaxing its grasp in the United States for many years to come, as of people denying themselves the luxuries of cotton, sugar, and tobacco. I have failed to discover a single element in active operation which points to a different conclusion. At a moderate estimate the slaves in the United States are worth, at the present moment, £450,000,000. This is sufficient to show how firm a hold the institution has upon the vested interests of the country. No scheme of emancipation has been proposed that would not be attended with a sacrifice of property, which it is vain for us to expect to be made. Thus slavery, I fear, will not loosen her grasp, till labour, which is at present obtained by coercion, can be otherwise commanded through the force of circumstances."

Our space forbids our enlarging at present on Mr Russell's notes on the climate of America; but our readers may rest assured that they are not the least interesting and instructive part of his book. And we trust that the foregoing remarks, culled principally from the agricultural portion of his work, will be sufficient to show them what a fund of useful information it contains. To farmers in general we can recommend this book as containing much that will be sure to interest them, and to inform them on some points which were a source of alarm to them immediately on the repeal of the Corn Laws, but which may be regarded now as mere bugbears. They will find, for instance, that the land and districts adapted for the cultivation of wheat are but of limited extent, and that the soils on which it has been raised for a long time are now being rapidly exhausted. To those who are looking to America for a future home, we would recommend the book, as they would be sure to find a safe guide to direct their steps in the New World, in as far as its climate, soil, and general system of agriculture are concerned. He discovers to them no El Dorado; but he points out, in accordance with other writers on this subject, a vast unoccupied country to the west, whither the tide of emigration is flowing. There peace and plenty will be found, sweetened by a life of labour; for no emigrant, no pioneer of civilisation, must ever expect to lead a life of ease. For ourselves, we close the book, and these remarks on it, with the regret which we feel on parting with a friend whose society has afforded us much useful information and pleasure.

NOTES ON NOVELTIES AT THE AGRICULTURAL SHOWS OF 1857.

By Robert Scott Burn.

The Royal Agricultural Society of England. Meeting at Salisbury, July 21, 22, 23, and 24.

The Highland and Agricultural Society. Meeting at Glasgow, August 5, 6, and 7.

The Yorkshire Agricultural Society. Meeting at York, August 6 and 7.

As first in point of date, and decidedly first in point of import-
e, we commence our paper with a notice of the more striking
he novelties at the meeting of the Royal Agricultural Society
Salisbury. This has undoubtedly been the first in point of
ellence of all the Shows of the Royal Society which have yet
n held. It has been decidedly successful, and this not from
adventitious aids which the archæological attractions of the
in which the show was held, the hospitality of the citizens, or
glorious weather which prevailed at the time, might have
orded to the great gathering, the high feast of the Genius of
riculture. It was entirely a legitimate success, dependent upon
e of those aids we have already alluded to, but upon its agri-
ural merits alone. At no meeting has there been such a full
ection of implements, or such a splendid show of live stock, as
his. Nor is this to be wondered at: all improvement is pro-
ssive; the feeble attempts of infancy but tend to cultivate the
its and enlarge the faculties which lend strength and vigour
naturer life; and the tiny shows of bygone years, which but
rded lounging-places to an indifferent public, or an opportu-
for the incredulous and the "slow" to indulge in sneers at
wfangled notions and graceless innovations"—each gathering
h experience from its predecessor—have resulted in those
ntic combinations, which alike please from their novelty, and
h lessons of practical worth from their utility, and of which
recently displayed at Salisbury has been the most remark-
. Nor although the last few years have witnessed such mar-
ous strides towards perfection—of which each succeeding show
been the exponent—need we look forward to our speedily
ving at the culminating point; with such a wondrously expan-
science as that of agriculture, we still progress towards a
t which each year may to us seem like perfection, but which
erience shows us is as far off as ever. Much has been
ten and more has been said about the uselessness of these
vs; but while freely admitting that there may be and is
h to reform connected with them,—that the *prize system*, to
may cause merely spasmodic efforts, which have the appear-

ance of life, but are in reality dead; and that the *implement trials* might, with benefit, be made to have as much reality as they have now of name, and of real work and less of play about them,—still we think that the services rendered to the cause of agricultural progress, by the holding of stated agricultural shows, have been neither few nor unimportant. They may be termed bazaars merely; but granting they are this and "nothing more," in bringing men to them we enlarge their ideas; we rub the rust off them by contact with other material; and truly he who rubs shoulders with his fellow-men in the world's busy marts, has a better chance of becoming world-wise, and "getting up to a thing or two" likely to be of use to him, than he who sits at home, "contented wi' little," but with an unfortunate indifference to the possession of "mair." And surely he has little chance of getting in a good stock of the *newest* and the *best* of articles, who sneers at the utility of going to a full market, but puts up at the nearest huckster's shop. We can scarcely conceive of the dullest fellow who ever trod in "high-low" or sported "smock," walking through the alleys of an agricultural show without having some new thoughts awakened, or some slight desire to know what it was all about. And the slowest farmer might well be inclined to ask if none of the implements he stood gazing at could be of use to *him*, and whether *he* could raise and rear such mighty cattle, or such gigantic sheep, as rouse his wonder. For spreading knowledge, it is a great matter to rouse curiosity and incite to inquiry. Our shows have done this good — the amount of which it is difficult to estimate—they have roused curiosity and stimulated inquiry. If they have not taken the high position and assumed the positive usefulness of a guide-book, which points out the pleasant spots on the road to be visited, or the dangers to be avoided, they have at least acted as finger-posts to indicate the direction in which the traveller may quickest and most economically arrive at his destination. And this, though apparently a humble, is in reality—we perpetrate no pun, good reader—an exalted position to occupy. With these introductory remarks, not altogether unsuggestive we hope, we now proceed to detail some of the more striking novelties which were displayed at the Salisbury Show.

Some of our readers may not be aware that, so far as the trial of implements and machines was concerned, a very important change of procedure in the routine of proceedings of the Royal Agricultural Society was inaugurated in 1850. Up to that year it had been the custom to have the trials—and consequently the prizes awarded—extended over all the vast range of implements and machines indiscriminately. This plan, in the early years of the Society, did not result in much inconvenience, from the paucity of exam[illegible] [illegible] but as agricultural science progressed, and

its mechanism received a corresponding stimulus, the number of implements and machines increased amazingly, till at last the inconveniences attendant upon the trial of the whole range of agricultural mechanism indiscriminately became so striking, and resulted in decisions so unsatisfactory, that it was wisely determined to limit the trials of each year to one class of implements—leaving the other classes to remain for exhibition merely, without any reference to prizes. For this purpose the Council adopted the plan of triennial trials; the classes being divided as follows:—

1st, Implements for Tillage and Drainage.
2d, Machines for the Cultivating and Harvesting of Crops.
3d, Machines for preparing Crops for Market and Food for Cattle.

The first class was tried last year at Chelmsford; the second came into rotation this year at Salisbury. The class embraced drills, manure-distributors, horse-hoes, hay-machines, mowing and reaping machines, horse-rakes, carts and waggons. To the list of prizes for these was added a special prize of £500 for a steam-cultivator.

This special prize last mentioned may be said to have been *the feature* of the trials. Cultivation by steam is a matter on which, for many reasons, public attention is fixed, and the trial for so handsome a prize was likely to create much interest. The prize was announced in terms as follows: "For the steam-cultivator that shall, in the most efficient manner, turn over the soil, and be an economical substitute for the plough or spade." The reader will here notice an ambiguity of statement, which is apt—indeed is likely, as recent events have shown—to lead to grave misunderstanding. We would here have the reader to note the marked distinction that exists between the terms "steam-ploughing" and "steam-cultivation." The first is definite beyond any misunderstanding; it simply means the application of a new power to an old implement, the plough, the peculiar characteristic of which is, that the soil is laid over in slices, all at a definite well-known angle. This is ploughing, and only one implement we have, can perform it. This precision of meaning does not apply to the term "steam-cultivation." This may include operations from the simple ploughing down through a variety of gradations, to that of harrowing or pulverising the soil. It may include ploughing, and it may also, nay does, include rotatory cultivators and steam digging-machines. To a neglect of the obvious distinction between the two terms may be attributed the vagueness and uncertainty of the announcement of the prize offered by the Council of the Royal Society. As given, it seems as if its framers had been disposed to please at once the two great parties—the advocates of rotatory cultivation, who have doomed the plough to a speedy

death as old and effete; and those who think the plough the best implement, and that it only requires a new power to make it perfect. The result of this attempt might, however, have been practically to exclude all parties who used the plough; for it is difficult to conceive how one thing can be a substitute for the same thing—a plough for a plough, or a spade for a spade. The work done by either is definite in its character, no matter by what power the implement is worked. Had the announcement been simply "for a cultivator worked by steam for properly preparing the soil" for the after processes of farming, or had the words "economical substitute for the plough as worked by horses, and for the spade as used by manual labour," been used, all doubt would have been removed, if indeed it had ever arisen. As it is, misunderstanding is very likely to take place.

The competitors for this great prize were four in number—Boydell, Williams, Hall, and Fowler. It militates nothing against the principle of steam-cultivation to say that the result of the trials has been a disappointment—has, in fact, put back steam-cultivation in the estimation of many who were disposed to be sanguine as to its triumphs. The fact is, too much has been expected of it. In the ardour of anticipation its transition state has been overlooked. It is but the sheerest folly to expect that a new thing can be a perfect thing. Had Fulton, when his steam-boat moved from the wharf, no doubters around him? and when the engines refused to work, and left him a while motionless in the stream, did no doubters then laugh loudly?—to laugh afterwards, to be sure, as many since then have done, the wrong way, when steam navigation was an accomplished thing, and when the waters of the Atlantic, as well as those of the placid river, were paddle-ploughed. This failure of steam cultivation—for the most sanguine cannot call it a success—has not made thinking men lose faith in its ultimate accomplishment. We do not say that it will be accomplished by any of the methods now before the public; but that the giant power of steam will some day or other be used easily and economically for the cultivation of the land, we decidedly believe: in this we but think with many of our eminent engineers: to think otherwise would indeed be a libel on the mechanical genius of the day. What is wanted is mechanism which can be taken out at any time to the field by the ordinary [illegible]rm-labourer, without involving much hard work or difficulty [illegible] locom[illegible]ion—mechanism which will do its work without neces-[illegible]atin[illegible] [illegible] [illegible]al re[illegible]airs, or the attendance of a party possessed [illegible] more [illegible] [illegible]bility than usually falls to the lot of farm-[illegible]ervants. Th[illegible] [illegible]at is wanted, and is certainly what has not [illegible] bee[illegible] [illegible] [illegible]out or effected by any single inventor. What [illegible] comb[illegible] [illegible]he results of the labours of all the inventors [illegible] [illegible] hard [illegible] say [illegible] [illegible]clined to think that

this combination would go far to realise the essentials of a good system of steam cultivation. Inventors are not, we are afraid, freed from the jealousy which tinges many a cheek, and to effect the fusion of interests necessary to obtain the above combination, might test diplomacy as much as in the celebrated case of Lumley's *pas de quatre*.

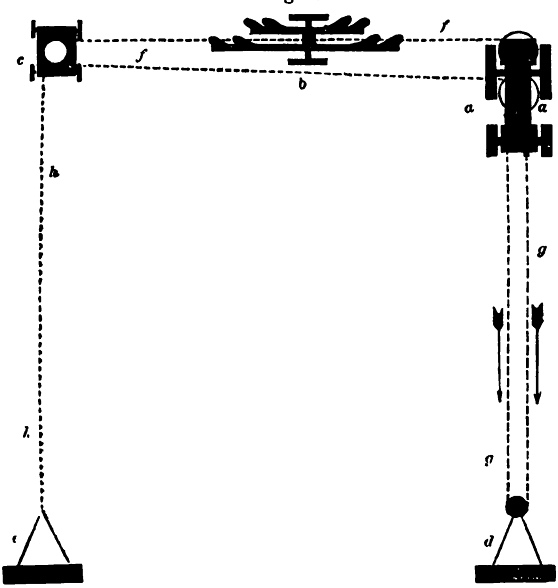
Of the four plans competing, two were on the plan of "direct," two on "indirect" traction. Of the former class, Boydell's was the most successful. It undoubtedly possesses wonderful power of locomotion. It left the show-yard with its tank of water, and ascended to the trial field, which was situated on the top of a high hill, with apparent ease. Some idea of the difficulty of the task may be obtained when we mention that the rate of ascent up the incline leading to the trial field was one in seven and a half. In ploughing, the engine dragged after it six ploughs, each with an attendant—a clumsy enough arrangement, and which, whether from the fault of the attendants, or the construction of the ploughs, or the nature of the land, we do not now say, executed but indifferent work. It also dragged after it, at another period of the day, one of Coleman's large cultivators, with 11 tines, and which requires in ordinary circumstances from 14 to 16 horses. The work was said to be well done; but, in commencing operations, we saw an amount of "tinkering"—this is the most expressive word we can use—and a lack of preparation which no farmer would tolerate in his field in everyday practice. There can be but one opinion as to the efficiency of Mr Boydell's engine in overcoming obstacles and traversing difficult ground; its capabilities as a substitute for horses in ploughing will raise a diversity of opinions, many by no means favourable.

The principal peculiarity of Mr Hall's direct-traction engine is the employment of high-pressure steam-power 300 to 400 per square inch. The engine is provided with expansion gear, which enables the steam to be cut off from 1-18th up to half stroke. The result of the arrangements is an exceedingly light and economically-worked engine. Mr Hall applies Boydell's endless railway to his engine, and intends to apply a plough of his own invention.

Of the two plans on the indirect-traction system—namely, Mr Williams' and Mr Fowler's—the latter was decidedly the most successful. The work we saw performed by it was satisfactory, and it was very quickly performed. After the engine and plant were dragged—at the expense of no small labour and time, however—into position, the work was gone through in such a business-like manner that fairly redeemed the trials, and retrieved somewhat the character, of steam ploughing. Although much has to be done to simplify the arrangements, and place the mechanism adopted within the easy range of ordinary farm skill and intelli-

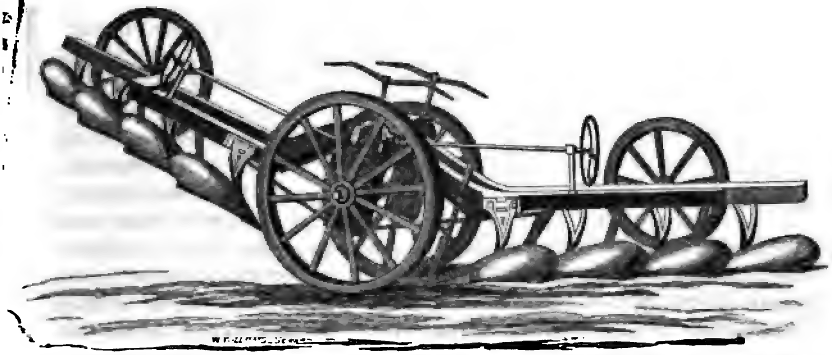
gence, still we think, of all the plans yet introduced, this of Mr Fowler's is the most likely to succeed, and presents, at all events, many features of business-like utility. Mr Fowler has done more, we think, in steam-ploughing, and on a commercial basis—that is, ploughing by contract—than all the others put together. We heard a well-known farmer, who farms very largely in a district where Mr Fowler has already ploughed by contract, say that, if the plough returned this autumn, he could find as much work for it as it could go through, so well pleased was he with its performance. As many of our readers may not be aware of its peculiarities, and as those who do know of them will be glad to hear of the recent improvements introduced by the inventor, it may not be amiss to sketch briefly an outline of its principal features. The following diagram will illustrate the disposition of the mechanism in the field, with the mode of its operation. The engine and windlass combined are placed at *a a*, and are moved at intervals along the field in the direction of the arrows, a distance equal to the breadth of 4 furrows. There are two drums or windlasses worked by the engine, which alternately wind up the wire rope; while one is being driven by the engine, the other runs free, and is giving out its rope—the rope passes round a pulley or sheave in the anchor *c*. The fixed anchor is at *d*, and serves as a point of resistance, by which the engine winds itself forward. The "self-adjusting" anchor *c* is placed opposite the engine *a a*, at the extremity of the furrow-line. This is moved along the field coincidently with the engine as the ploughing progresses. This self-adjustment of the anchor *c* is a recent improvement, and is effected by the passing of the wire rope *f f* over the drum of the anchor, working a barrel round which a second wire rope is coiled, the extremity of this being fixed in the ground at *e*

Fig. 1.



to afford a point of resistance. The anchor is mounted on sharp-edged discs or wheels, which cut their way slowly along the ground. The plough-carriage *b* traverses the space between the engine *a a* and the anchor *c*. The whole arrangement forms a parallelogram, the breadth of which is equal to the distance between the engine *a* and anchor *c*, which are placed at the headlands — and the length equal to the distance between the engine and the fixed anchor *d*. For want of space the diagram shows a square. The wire rope *f f* is prevented from dragging over the land by being placed over a series of grooved pulleys or wheels, placed at intervals along the line of draught. Each pulley is supported in a light wooden frame furnished with handles; and as the plough frame *b* approaches one of these light wheel-frames, a boy removes it out of the path of the plough; and after it has passed, he places the return rope, which is attached to the hinder end of the plough-frame, over the wheel or pulley. On the plough-frame reaching the headland, it is moved a little beyond the end of the furrow, and tilted up, thus taking the ploughs which have been last in action out of the soil, and placing the others in contact with it. The engine *a a* and anchor *c* have at this point been moved along the field a distance equal to four furrows—and the wire rope *f f* being already placed in the pulleys of the light wooden frames above mentioned, the engine is started, and the drum which previously was giving out the wire rope now winds it up, and the plough-frame *b* is drawn across the field—eight furrow-slices have thus been ploughed over in two journeys of the plough-frame. The plough-frame is shown in fig. 2.

Fig. 2.



The trial of the reaping and mowing machines resulted in bringing out what was undoubtedly the principal novelty of the Show—namely, the American Eagle Reaping and Mowing Machine. This is the invention of A. H. Caryl of Sandusky, Ohio, and was exhibited by the English agent, Mr H. Clayton of the Atlas

Works, Dorset Square, London. This machine took the prize as a grass-mower; and from the simplicity of its mo parts, its light draught, and easy adjustment in overcon obstacles, it attracted great attention. The framing is carrie bearings upon the axle of the main carriage wheel; prece which the pole is placed, while the driver sits behind. By arrangement the whole is balanced, so that no more weight t on the neck of the draught-horses than is necessary to steady movement; and by merely pressing with his foot on the hind pa the framing, the driver, with amazingly little exertion, is able to the cutter a height, if necessary, equal to eight inches—thus coming all obstacles, and clearing the furrows. The principal tures, however, are the driving and cutting apparatus. This chine has virtually a double set of cutters, the upper ones recipr ing at a much slower rate than is usual in other machines, whil under ones are stationary, and, projecting an inch beyond the li the upper ones, act at once as guards and cutters. All the bl both of the lower and upper series, are independent of each o and each is connected with the bar by a screw-bolt. This arra ment enables a broken or disabled blade to be easily rem and a perfect one substituted. The upper blades are held dow a spring-pressure bar, so that the operation is similar to th shears, the grass being cut between two edges. The cutting-b are made of iron at the back, and the front or cutting-edges o best cast-steel. The iron giving strength, the steel can be as hard as desired. The driving gear is amazingly simple, contrasts favourably with that of other machines, there bein entire absence of all toothed gearing; a cam, fixed to the of the cutter-bar, and a series of curved slides in the main w in which the cam works, being substituted. It is difficult, out the aid of drawings, to give an idea of the movement. I reader will imagine the periphery or tire of the main wheel to a series of curved apertures cut in it, of equal size and at distances, these apertures being connected with each othe narrow cuttings, thus forming a species of sinuous path roun entire circumference of the wheel—and farther, if he will su the cam of the cutter-bar inserted in this path—he will form idea as to how, by the passage of the cam from the small cut t large curved aperture, and from the latter to the former altern the cam will receive a series of jerks, alternately from side to which will thus impart a reciprocatory motion to the cutte which it is attached. From the nature of the movement, d apt to arise as to its ultimate economy. Certainly no first-class workmanship will stand the severe test of the operation. As a grass-mowing machine, all who have se operation think of first-rate excellence, and that it supp sideratum long ... hay making operations. It is rig

state that, in addition to the first prize at the Salisbury Show, it obtained the 1000 dollar prize in 1856, after a three days' trial at the Massachusetts Society for the Promotion of Agriculture, U. S.

Of the Reaping Machines competing this year at Salisbury, that of Messrs Burgess and Key took the first; that of Mr Crosskill the second; and that of Lord Kinnaird the third. To Messrs Dray's, which took the first prize, with high commendation, last year at Chelmsford, no prize this year has been awarded. This reversal of the decision of last year has, as may be conceived, created no small surprise, and has fanned again into fierce combustion the flame of rivalry. The battle of the "reapers" resembles, to compare small things with great, in warmth of debate, and we may add, lack of courtesy, the celebrated battle of the railway gauges. Into the merits of this controversy we have no desire to enter, further than to say, that each of the rival machines presents points of excellence which the other lacks; and we think that too much stress is laid upon the question of the delivery of the cut corn.

Messrs Burgess and Key have introduced a decided improvement in their reaping-machine. In the machine of last year, a wedge-shaped dividing-board was used to bring in the corn to the action of the knives; this, however, did not act properly, and a conical screw has this year been substituted, with marked success. It is just the additional movement which has been required to make the Archimedean screw side-delivery complete in its operation. In this machine, as our readers are doubtless aware, the corn, after being cut, falls upon three screws, which are placed across the machine in a direction at right angles to the path of the machine. The combined action of the reel and these screws finally deliver the corn at the side of the machine in a continuous swathe. In Dray's machine, the corn, on being cut, falls on a tipping platform, which, on receiving a quantity of corn necessary to form a sheaf, is tipped up by the attendant, when the corn is delivered to the ground. The attendant uses a rake to bring the corn up to the cutters. Mr Crosskill's machine, which took the second prize, is a modification of Bell's, with a side-delivery and M'Cormick's cutting-apparatus. Of this machine, the Judges report that its work was well done, but the swathe was not so well laid, nor so good and even a stubble left as by Messrs Burgess's; and this, we believe, was caused by its not being well adapted to cut across furrows, and to make perfect work; and the scattered straws left in the swathe, we think, were owing to a fault in the construction of the endless-band for the side-delivery. The machine has two men to work it, but cuts fast, though the power required is more than that which is consumed by Messrs Burgess and Key's machine. Of Lord Kinnaird's machine, which took the third prize, and which is a modified M'Cormick's, the Judges report

that "it worked well, but we thought the horses were driven to fast for farm-horses; and the machine, although cheaper tha those spoken of above, was not to be compared with them fo workmanship. The driver was the only attendant necessarily re quired."

In drills and manure distributors little novelty was displaye The most recent inventions we described in the March nun ber of this Journal, so that we are now spared the necessity (going fully into the consideration of this department. W noticed a very ingenious eight-row seed-planting machine, po sessed of some noticeable features. It is the invention of Joh Freer, of Rothely, near Loughborough, Leicestershire. Tl planters are made in the wheel form—sixteen planters formi each wheel. The planters receive and deliver the seed as th roll along. Each planter is provided with a piston, which placed between the side-pieces or tongues of the planter. Tl piston has a reciprocatory motion imparted to it by appropriate m chanism, and its end or termination is of such a size as to fit e actly the orifice of the planter, which is about $\frac{5}{8}$ths of an in square. The length of the planter is about 9 inches, the depth thickness is $\frac{5}{8}$ths of an inch throughout, but the width tapers from th size to about double the width at the root. The pistons are connect in pairs by connecting-rods extending across the centre of the whe so that the piston of one planter is connected with the piston of anoth planter on the opposite side of the wheel. The length from point point of the two pistons is 4 inches less than the diameter of whe or the extent from mouth to mouth of one pair of planters; the exte of play, or reciprocatory movement of the pistons, is therefore equal 4 inches. At the root or widest end of each planter a hopper formed, the mouth of which opens in the direction of the plant point. When the mouth of the hopper arrives at a vertical po tion, the seed drops into it, and is conveyed to the root or seed-b of the planter, where it remains till the point descends near to t earth, when the seed, by its own gravity, falls to the point of t planter; and after the hole is made by one planter in the earth t piston is pushed down and opens the point of the planter. T seed then drops into the earth, the piston pushing it before it un it leaves the machine; the piston then closes up the orifice of t planter, preventing the entrance of earth, which would otherw choke or stop it. While the piston of the bottom, or under-plant [illegible] is falling outwards, the piston of the top, or opposite one, c [illegible]ed to it, is falling inwards, the point of the planter being at t same time closed. The pistons of these two planters remain in t same position until, by the half-rotation of the wheel, the bott plant[illegible] the place of the top one. The planters in that p of the [illegible] of the wheel which is moving upwards, are [illegible] flush with the ends of the plante

in those in that part of the periphery of the wheel which is
ding, the pistons are withdrawn, and the planters closed,
to enter the soil. Knives or scrapers for cleansing the sides
ints of the planters are fixed on the hoop between the sides
wheel. As before stated, the planters are placed in the peri-
of the wheel, and are of such a form as to give the wheel a
serrated periphery. The method by which the orifices of the
rs are opened and closed is simple and ingenious. Each planter
o sides or tongues; one of these is fixed and bent at an angle
angle being in a position near the centre of the length of
r—the other tongue moves on a centre, and is provided with
rved arms. The face or extremity of one of these, when the
of the planter is closed, rests against the face of the extre-
f the fixed tongue; but when the piston is pushed outwards,
d comes in contact with the curved end of the movable
which rests on the fixed tongue; the two are thus forced out
tact with each other, and the orifice of the planter opened.
e piston, on the contrary, being thrown inwards towards the
of the wheel, it comes in contact with the other curved arm of
vable tongue, pushes it outwards, and consequently moves the
te curved arm inwards, and brings its extremity in contact with
f the fixed tongue when the orifice of the planter is closed. The
s are moved to and fro as follows: To each is provided a
ting wing or arm; this passes through a slot in the side of the
r—the length of slot being equal to the stroke of the piston;
rojecting arm comes in contact with a slide at intervals, which
the piston up and opens a planter on the one side, while the
of the planter on the opposite side is forced down, and closes
anter. There are other ingenious points connected with this
ng or dibbling machine, such as the seed-meter or measure,
space does not allow us to notice.

gma's" inventions connected with the new method—which has
ately attracting considerable attention—of planting, setting or
ng grain, pulse, mangold, &c., were exhibited at the Show by
s Powell, of Ticehurst, near Huntgreen, Sussex. We propose
uture period to notice the system advocated by "Sigma,"
while directing our attention to the patent depositor, dibble, or
planter, of which the following is the inventor's description:
gine an angular piece of wood, cased in brass and shod with iron,
long, from the angles of which project 4, 5, 6, 7, or 8 small steel
if I jerk these by means of an upright handle into the ground,
en draw them up without removing the angular piece of wood,
hole will remain open, excepting in very dry sand, and even
s case, the steel dibbler, when pushed down again, would thrust
ed that might have been dropped into the hole as far as the
r was pressed down; but to make sure, I have adopted the
ing plan: I have had small brass nozzles firmly fixed to this

angular piece of wood (the flat upper surface of which wood forms the floor of the seed-box), which nozzles penetrate half an inch or so into the holes, and, acting as a guide, cause every seed to be buried, and firmly planted by the small steel dibblers. The action of the implement being thus, it is jerked lightly on the ground, which causes the projecting dibblers to penetrate up to the angle; the dibblers by means of the handle are then withdrawn, the implement being retained in its position by means of the foot placed on a step; the seed falls into the holes, as many grains as may be thought advisable; the handle is then pushed down again, when every hole will have its allotted number of grains firmly planted. Thirty-four of these operations can, on an average, be effected in a minute—*i.e.*, with a 5-row depositor or 170 holes—and the work executed in the most perfect manner."

The following detailed description of the constituent parts may give a clearer idea of the construction of the apparatus than the foregoing general description. The trough or seed-box is angular in form; in the front of this, five perpendicular holes are bored, equidistant from each other; communicating with these perpendicular holes are other apertures leading obliquely up to the bottom of the seed-chamber. These are the channels of communication between the perpendicular holes and the seed-box. Stretching from end to end of the seed-box a flat bar is placed, the ends of this passing out through apertures in the ends of the seed-box, and its flat side lying in close contact with the floor or bottom of the seed-chamber, in such a way as to cause it to completely cover, provided it were solid, the apertures of the channels leading to the perpendicular holes already described. Holes, however, corresponding in diameter to those in the bottom of the seed-box are bored in this flat bar. Now, by moving the bar from side to side, when the solid part of it comes opposite a hole in the floor of the seed-box it closes it up, so that *all* communication is cut off from the interior of the seed-chamber and the perpendicular hole; but when the flat bar is moved to the side, so that the holes in it coincide with those in the floor of the seed-chamber, the communication is open. The seed-box is provided near each end with a vertical standard which supports a cross bar or handle by which the apparatus is lifted. In the perpendicular holes already described, five steel dibbles move up and down; these are fixed to a cross bar running parallel with the top of the seed-box, this cross bar having at each end a standard supporting a handle, which is placed a little above the main handle of the seed-box. By moving this handle the cross bar with its dibbles is moved up and down; the amount of play on the length of the stroke is such, that when the handle is pulled up to its highest point, the lower points of the dibbles are clear of the oblique holes communicating with the seed-box, and the holes in which the dibbles work. We have now to explain how the fla

bar is moved to and fro. Near the centre of the apparatus, a curved lever vibrates in a stud fixed to the side of the seed-box. The long curved arm of this lever passes through a slot in the lower bar which carries the dibbles, the slot being long enough to admit of the lever moving from side to side. In the slot two circular studs are fixed, the end of the lever passing between them. The lower end of the lever is inserted in a slot cut in the flat bar which lies in the bottom of the seed-box. If the long arm of the lever was straight, as the cross lever carrying the dibbles was raised and depressed, it would simply slide up and down between the studs of he slot, and no motion of the lever would take place; but as it is urved, the studs press upon it, and force it to move laterally, which, of course, causes a corresponding movement in a contrary lirection of the lower arm; as this rests in the slot of the flat bar, t is moved to and fro, alternately covering and releasing the aperures in the bottom of the seed-box. Brushes are placed to come n contact with the upper side of the flat bar, thus keeping the pertures always open.

The cost of a 5-row depositor, with which a man can plant about one acre a-day, is £3, 3s. The 4-row depositor bean-dibble, invented by Sigma, contains four bean-depositors, arranged thus—on one side of the implement there are two depositors at 7 inches apart, then an interval of 27 inches for horse-hoeing, and then two more depositors at 7 inches apart. The price of the implement is £3, 6s.

Of haymaking machines, the first prize was awarded to that invented and manufactured by William Newzam Nicolson of Newark. In our article on the Smithfield Club Show in the March number of this Journal, we adverted to the modern system of working haymaking or tedding machines, namely, that in which two motions re required, the "backward" and the "forward." In the one, he fork, or tine barrel or cylinder, revolves so as to completely hrow up and turn over the cut hay; in the other, the forks or ines, as they revolve, simply move or lift the grass turned over by he first movement. In the ordinary class of improved machines, he two motions are obtained by the use of an intermediate or third wheel. When the forward motion is desired, the third wheel is rown out of gear, and the toothed wheel of the main drivingheel engages with the pinion fixed in the barrel or hollow shaft of e fork or tine-carrying cylinder. When the reverse motion is quired, the third or intermediate pinion is thrown into gear with e other two. In Mr Nicolson's machine, this intermediate heel is dispensed with, thus simplifying the mechanism, and reducg friction, and the power necessary to work the machine, by recing the number of the working parts. The two motions are tained thus: The nave of the main driving-wheel is formed of a ge cylinder or hollow drum. This cylinder or axle-box contains

on one side an annular or internal toothed wheel (*a*)—that is, a wheel with the teeth internal, not external, to its outer periphery; and on the other or opposite side, a spur-wheel (*b*) of the ordinary description. These are fixed to and form part of the axle-box. At a point above, and a little to the left of the centre of the axle-box, the shaft or hollow axle of the fork-carrying cylinder revolves, having its bearings on the sides of the axle-box. This shaft carries two pinions, one of which (*c*) engages with the annular (*a*), the other (*d*) with the ordinary spur-wheel (*b*). When the machine is travelling from place to place—that is, not engaged in tedding—these two pinions (*c d*) are placed midway, being kept in position by a simple catch in the shaft between the two wheels (*a b*), so that none of them are in gear. By moving the fork cylinder shaft to another catch the pinion (*d*) engages with the spur-wheel (*b*), and the forwar motion of the fork barrel is given; by moving the shaft to th third catch, the pinion (*d*) is thrown out of gear with the spur wheel (*b*), and the pinion (*c*) thrown into gear with the annula wheel (*a*), which gives the reverse motion. In addition to th simplicity of the driving gear, this machine presents other feature worthy of commendation. Thus the fork barrel is raised from lowered to the ground by the following simple mechanism: Th inside cover of the axle-box is lengthened out to form a long arm lever; this is terminated with a segmental rack, worked by a sma pinion of two or more teeth. The shaft on which this pinion keyed, passes through a hollow stay to the other side of t machine, where a similar pinion is attached, working in the se mental rack attached to the axle-box of the second driving-whe By turning a handle fixed on the end of the pinion-shaft, both sid of the machine are raised simultaneously. Hollow tubular iron used for the shafts, the back rail, the front bar, and the stays, the parts being all united together by casting upon them elbow and pieces.

Of various horse-rakes exhibited, that patented by Thomas Smi of Bredfield, Suffolk, is the most recent novelty. There are so points about it particularly worthy of notice. The peculiar feat is the combination of a counterbalance weight with each of t tines, each tine having an independent movement on the cent bar which sustains the assemblage. By this arrangement t pressure on the tines can be so regulated that they cannot sink i he land, dragging up and mixing the soil with the hay or stubl fault which obtains with some forms of horse-rakes. The lever by which the tines are simultaneously raised is also worthy of not ingenious in arrangement, and remarkably easily worked. T machine was highly commended. Of machines of this class the m decided novelty was the horse-rake of Messrs Marychurch and Sc of Haverfo[illegible] Vest Pembroke. This was highly commended " [illegible] its deli[illegible] being nearly self-acting."

n feature of the machine is the working of the teeth, or tines, by forward motion of the implement itself. The following is the thod patented by the inventors: A strong iron bar, which re- ves on its own axis, carries the tines or teeth. On this bar, hin the frame, two cranks (*a a*) are fixed; a third crank (*b*) is d to the extremity of the shaft, which extends a few inches be- d the frame. The extremities of the cranks (*a a*) carry a bar (*e*), ich is parallel to the tine bar, and which passes under the ends the tines—thus when the bar *e* is raised, the tines all rest upon Fixed to and revolving with the main driving-wheel is a ratchet- eel (*d*). A lever (*e*) vibrates on the pin of the outside crank (*b*) a centre; this lever is provided with two tongues (*f f*) and a ved end (*g*). A cord is attached to the end of the lever (*e*), and ried by the attendant leading or driving the horse: when re- red to discharge the load which the tines have collected from field, he raises the end of the lever (*e*) next him; this depresses other end, so that the two tongues (*f f*) fall into corresponding th of the ratchet-wheel (*d*); as this revolves by the motion of the ving wheel, the lever (*e*) is raised up, and as it works on the nk or pin of the outside crank (*b*) as a centre, it moves this nk (*b*), and as this is keyed to the shaft which carries the crank *a*), it turns the shaft, lifts the crank (*a a*), and the bar (*c*) on ich rest the tines. The tines are thus raised upwards, and ieved of their load. The tines having arrived in this position, back of the next tooth of the ratchet-wheel to that in which the t tongue of the lever was engaged, presses against the curved l (*g*) of the lever (*e*), throws it out of gear, and the teeth fall of ir own weight. The frame and the teeth may be set to any in- ation when the rake is at work by turning a handle attached to crew, which works into a nut jointed to the shaft.

The light drag-hoe and hand-cultivator, invented by Sigma as stitutes for the horse-hoe, may here be noticed. The imple- nt is suitable for all crops growing in rows, and is manufactur- e in a variety of ways. In one form it is merely a share, of the lth of the row to be hoed, turned up at each end, the end one longed so as to form the letter V; at the centre angle a goose- k is fixed into a handle. The share, having both edges sharp, be thrust backward or forward, the labourer being able to hoe ast nearly as he can walk. To convert this into a drag-hoe, a ght is placed in the top of the V, which is provided with slots keep it tight, and a cross handle is provided to the shaft. This ss handle is capable of being shifted up and down, being tened by a wedge at any point desired. In the third form of implement, the V-shaped part is made to expand or contract s to suit shares of sufficient widths; this is done either by joint- them like a pair of shears, or by means of two straight slotted s. The same handle is suited to this apparatus.

Of the minor novelties not strictly agricultural, space allows to notice one only—that, however, one which has attracted considerable attention, and bids fair to revolutionise practice in the interesting if not important branch of bee-keeping; we allude to the "Platform Bee-Hive," an American invention. In common with other patented bee-hives, this has the convenience of two tiers of four boxes each—so that when one is filled with honey, the bees have access, and will transfer themselves to the other box, the filled box being taken away. The feature which distinguishes Mr Davis's plan from all others, however, is the provision made for enabling the bees to work all winter without the loss of an hour. This is effected by supplying them with an inexpensive composition, of which the bees are so fond as even to prefer it in many cases to flowers. The platform presents the appearance of a cottage pianoforte, of which the two tiers of hives form the upper part. The projecting portion at the front is covered at top with woven wire-work. The feeding-boxes are below this, and connected by openings with the boxes above. The feeding-boxes contain double floating platforms, provided with narrow openings; through these the bees can sip at will the liquid composition without clogging their legs or wings with it. The dirt or droppings of the bees falls into a space underneath the hives, thus preserving the cleanliness of the hives and the health of the bees. In cold weather the bees are removed from out of doors into shelter, and a temperature of about 75° Fahr. kept up by a stove or a steamer. The hives are provided with glass backs and fronts, through which at any time the bees can be inspected while at work; but as they prefer generally to work in the dark, wooden shutters are provided to obscure the light. As often as it is necessary to give them new comb to work on, the bees can be immediately transferred to another box, thus obviating the necessity of destroying them on the old system. The expense of the composition supplied to feed the bees during winter may be estimated at 1½d. per pound. It may be right to state that this invention, at the agricultural meetings in the United States, took the prize over all other competitors.

THE GLASGOW MEETING OF THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND.

Of this—confessedly the most successful of all the Society's meetings — the feature which at once claimed the attention of the English visitor was the mode of classification of the implements and machines contributed. For agricultural shows there are two modes of classification eligible: first, according to the kind of work to be performed by the implement or machine; second, giving a certain amount of space to each individual manufacturer, allowing him to arrange his contributions as best he thinks fit. Of these two modes the first is the philosophical

he second, the commercial; and they are to be judged of from ntirely different points of view. If the object of the Show is to acilitate the farmer in making comparative observations of the different machines, and to serve some important points in agricultural education, there can be no doubt that the first mode is in every way the best. If, however, it is considered essential to consult the commercial interests of the exhibitor, and, to facilitate his obtaining orders, to create a sale for his wares, the nearer the approach is made to the character of a bazaar the better. It is simply a question between the farmer and the implement-maker, as the buyer and the seller, and whether it is politic to study the interests of the one more than those of the other. For purely agricultural purposes it is evident that the first classification is the best; for it is obvious enough that, of any machine which the farmer is wishful to purchase, the more specimens—that is, of different makers—he sees, the better. A thoughtful walk through what may be called the confusion of Salisbury and the well-ordered philo-sophical arrangements of Glasgow, would have soon made this clear o any one previously doubtful of the truth of the position. Not, et it here be noted, that we are carping at the arrangements of the Salisbury Show—they were admirable, so far as the system of classi-ication adopted admitted of; we simply wish to show that where farmer was desirous of comparing the arrangements and work-nanship of a machine brought out by one manufacturer with those f others, before he could go from one place to another, hunt up he specimens, and examine the peculiarities of each, all data for omparative observations would have evaporated from his brain. Few mechanics could effect the object—how could we suppose far-ners to be successful? The Judges adjudicating the merits of each mplement are not thus expected to wander from stand to stand—t least if they do, their judgment will fail in some particulars; and very farmer would undoubtedly be the better if the shows enabled him to have the facilities of the Judges. It is for the Societies to ay how far in this way they wish their shows to be truly educa-tional institutions; nor would this facility of making comparative bservations be prejudicial to the interests of the manufacturers hemselves. We can easily imagine some, who to crude notions of rrangement add imperfection in workmanship, objecting to this acility of comparison being afforded to the buyers; but we have ome difficulty in understanding how those who sell the best nachine of any class fear competition. In truth, we do not think hat this fear exists amongst our celebrated manufacturers—it is heir truest interest and wisest policy to court comparison; at the ame time, before closing our remarks on this subject—not altogether vithout its importance to the agricultural world—it is but right to nention that the system of classification adopted by the Highland Society does entail a hardship on those manufacturers who are

desirous to do a trade at the show—as who of them is not?—forcing them to have either an assistant at each separate depa ment to explain to inquirers *their* machines and implements the exhibited, or, failing this, to allow them to remain unrepresent altogether—an alternative which *no business man* likes to be forc to adopt. This is a grave difficulty, and it is difficult to see h it can be overcome.

As the object of our paper is to take notice of the novelti chiefly at the various shows, not to give a report newspa fashion, we have under the present division but little to say; numerous as were the machines represented, many of them eitl presented the stereotyped features which are seen at each successi show, or where new, have been already described in the first part our present paper, or in the paper given in the number of this Jo nal for March last on the Novelties of the Smithfield Club Sh For the purposes of this paper we deem it best, therefore, to take t classification adopted in the prize list as officially announced, a describe the peculiar features of the novelties of such sections as consider it necessary to notice.

In Section 4 (Subsoil Ploughs for Moor or Strong Land, for th or four horses), Mr Bentall took the first prize of £4. This imp ment, although no novelty to the English reader, may be so to some our Scotch readers; we therefore give a slight description of its pe liarities. One form of it has three shares, preceded by three poi arranged parallel with each other; the centre share and point p ject beyond the two others, this arrangement enabling the imp ment to penetrate the hardest soils, and gives it a steady moti It is mounted on three wheels, by which the depth of the work regulated: the central beam, to which the centre tine is fitted, two cross arms, each of which carries a side tine, the side ti having a lateral adjustment given to them as well as a vertical. this arrangement the distance between the side tines and the cen one is increased or decreased so as to take in a lesser or grea width of land. The width usually covered is 3 feet 6 inches.

In Section 10 (Consolidating Land-rollers), Mr William Cambri of Bristol took the first prize of £5 for his patent self-cleans clod-crusher. This implement has a high reputation in Engla and consists of a series of press-wheels on a central bar; each wh has a slightly eccentric motion on the bar, and the wheels are m alternately large and small.

In Section 28 (Liquid Manure Distributing-Machines), Mr Is James of Cheltenham took the first prize of £4. The liquid this machine is forced through a distributor, which gives a sho capable of covering from 10 to 15 feet wide. The joints are waterproof. The valve is prevented from choking by the emp ment of a double strainer through which the liquid manure is m to pass before it enters the body of the cart.

ı Section 29 (Liquid Manure Pumps), Mr David Falconer, Cau- ide Street, Paisley, took the first prize of £2. The arrange- ts of this pump are simple and ingenious: the two pump- els, so to speak, are formed of tubes of vulcanised India-rubber, are made to collapse and extend alternately by the reciprocating ement of a beam.

ı Section 30 (Straw-Cutters for Hand Labour), Messrs Richmond Chandler of Salford took the first prize of £2. This machine markable for the simplicity of its arrangements, its compact- , and for the excellence of its workmanship. By the use of hed rollers instead of the fluted ones generally used in straw- ers, the apparatus is nearly self-feeding.

ı Section 41 (Root-Washers), the same firm took the first prize of for a root-washer. To the back of the trough in which the ıder containing the roots to be washed revolves, two curved s are attached, one at each end: these extend beyond the ine. When the handle of the cylinder is turned in one direc- the cylinder continues to revolve in the trough, washing the ı. When they are judged sufficiently clean, the cylinder is ed to revolve in the opposite direction, when the toothed els at the end of the shaft take into the teeth of the curved s, up which the cylinder climbs, as it were, and delivers the toes; when empty, it rolls down the rack to the bearings in the of the washing-trough.

ı Section 42 (Steaming Apparatus), Messrs R. and W. Smith and of Eglinton Engine Works, Glasgow, took the first prize of £5. apparatus is exceedingly compact in arrangement, and com- in its details; the boiler is on the Cornish or internal-flue iple, and constructed specially with a view to economise fuel.

YORK MEETING.

ıis, the twentieth meeting of the Yorkshire Agricultural ty, from its splendid show of stock, and its admirable collection ıplements, proved itself no mean rival, in bidding for public ır and attention, to the Royal Society's Show at Salisbury. ı a good authority we learn that, at the Society's nineteenth ing last year, £800 in prizes, besides gold and silver medals, awarded, £200 of this being given for implements alone; the ınt of the Royal Society for the same class at Salisbury this being only £173. The Yorkshire Society had at its show implements, less by 180 only than the number exhibited at bury. While at the latter show 154 exhibitors met, at the shire show there were no fewer than 93. But in stock the shire show bore off the palm; for while at Salisbury there only 151 horses, at the Yorkshire show there were 177; for short-horns at Salisbury there were 100 at the Yorkshire

show; while of poultry 220 entries were made, against 156 only at Salisbury. Certainly this Society owes no little to the district in which it is held, with a population of little short of two millions, noted for their enterprise in trade and commerce.

With reference to the implement department of this most important show, the two great features were the competition for the steam-cultivation and the reaping-machines. For the former the prize was announced in terms which, from their explicitness, contrasted favourably with the announcement for a similar prize competed for at Salisbury,—"For the best application of machinery impelled by steam power to the cultivation of the soil, £30." But still further to remove all doubts as to the comprehensiveness, and at the same time the precision, of the results aimed at as regards economy of working, the following note was added: "N.B.—It is essential that the operation performed by this cultivator, whether it be disintegration or complete inversion of the soil, be accomplished at less cost than similar or equal results can be obtained by horse or manual power, and that the work be also as well done by the former as by the latter agencies." In competition for this prize, which thus included steam-ploughs, rotatory cultivators, and digging-machines, two entries were made—namely, by the Patent Traction-Engine Company (Boydell's endless railway), and by Mr Fowler. Mr Fowler's apparatus was not brought forward, so that the only apparatus tried was Mr Boydell's traction-engine. Being engaged at Glasgow, we could not get forward to York in time to witness the trial of this machine. We understand, however, that the work performed by the engine dragging Coleman's scarifier—taking a breadth of 7 feet 9 inches, and a depth varying from 5 to 12 inches—was, on the whole, satisfactory. While working with four iron ploughs, which were afterwards used, the crank of the engine broke, and put an end to the experiment, which, from all we can learn, seems to have been the most successful yet attempted with this form of traction-engine.

For the reaping-machine prize three competitors entered—Mr Palmer, Mr Wray, and Mr Busby. The machine entered by the latter was that of Messrs Dray—Hussey's improved with tipping platform. The principal peculiarity in Mr Palmer's "Union" Reaper is the side and back delivery. This is effected by the use of a radiating platform at the back of the machine; the floor of this platform being composed of a series of rollers, those being of larger dimensions at the outer than at the inner extremities. The two outward rollers have a rotatory motion given to them. The attendant, sitting on the machine, uses a rake, with which he draws back the cut produce from the front of the machine on to the receiver-board, and the first of the set of rollers. On the line reaching the last rollers, which have, as above stated, a rotatory motion given to them, it is taken on by them, and delivered to the ground in a line parallel, or nearly

the line of draught. A steel separator precedes the cutters, ointed to the side opposite the working gear, it marks the divi- 1 the standing crop between the portion to come under the ion of the cutters and that left for the return of action. While g over the platform, the corn is retained till it is delivered to it rollers by a light fence. This is supplied with a roller, facilitates the passage of the corn over its surface.

peculiarity of Mr Wray's machine is, that it is worked with orse only. The inventor has aimed at making all the parts and moving the knife slowly. The knife is an endless one, ing freely from under the back of the machine.

he show-yard we noticed one or two novelties only. Amongst the compact portable gas-making apparatus of Mr B. Sanders, yerthorpe, attracted our attention. Gas can be made by it it much trouble, at the cost, it is said, of 1s. per thousand feet. This, we should think, was an under-estimate. The apparatus takes up little room, and its arrangements seem enough to be managed without difficulty by any farm-servant. iventor has fitted up nearly 300 apparatuses in different parts country.

the stand of Mr Buxton (Malton, Yorkshire) we noticed a mill for breaking, splitting, and grinding oats, pease, &c. s there is an ingenious adaptation of an Archimedean screw in aft which carries the grinding part. The screw is imme- r beneath the hopper which supplies the grain to be crushed, arries it to the grinding surface, over which it is distributed equal rate, so that if the mill is running fast or slow it choke. The grinding part is formed of a cone divided into sections; the first of these conical sections is provided with s of coarse-cut segments, adjustable by means of set screws hem for breaking, splitting, &c. The second conical section oth in its periphery, but is provided with a series of ribs g a screw, which carries the substances broken or split by st cone up to the action of the third and last cone, over the of which they are distributed equally by the action of the cone. A current of air is also projected over the surface of t cone, through the medium of the screw cone. The last provided with fine-cut segments, which grind the substances y the first cone into meal. A 12-inch mill will grind by from 10 to 14 bushels per hour. The cost of a machine s size is £12, 12s. We understand that the manufacture of achine has been taken up by Messrs Richmond and Chandler ord, Manchester, whose well-known mechanical abilities will ess result in making it a machine of first-class workmanship.

y of the machines and implements which presented features elty were also exhibited at Salisbury; and as we have already ed their peculiarities, we have now little more to do, in

concluding our brief notice of the Yorkshire Agricultural Society's Show, than to thank the Secretary, J. Hannam, Esq., for so courteously throwing all facilities in our way for inspecting the implements exhibited.

HIPPOPHAGY; OR, SHOULD WE EAT OUR HORSES?*

Doctor Johnson's beautiful story of *Rasselas* has made everybody acquainted with the Abyssinian prince who, satiated with the good things of this life, offered a noble reward to the inventor of a new pleasure. We know not whether royal *gourmands*, or gourmands in general, be inclined to reward such men as Soyer, that king of cooks. Having no evidence that they are, and our private opinion moreover, being that guzzling and gratitude rarely go together, we think we are discharging a duty when inviting our readers to give utterance to the feelings of the public stomach, in regard to th learned, eloquent, and most benevolent Professor of Zoology to th Faculty of Sciences at Paris. The pleasure he proposes for our ac ceptance is certainly not new; for many a comfortable meal o nutritious horse-flesh—ay, of ass, mule, and zebra flesh, has bee made of old time, and by many nations, further advanced i acquaintance with alimentary substances than we conceited modern are to this day. But the varied learning, the literary skill, th benevolent enthusiasm, the noble contempt for that peculiar cacchin nation for which the equine race gets credit, although only fro man do we hear what *he* chooses to call a *horse-laugh*,—these ar displayed by our learned Professor with a profusion by which w have been most agreeably surprised. We took up his book wit no great expectation of being either gratified with a literary trea or converted to the faith of the, as yet, small and derided sect (the *Hippophagi*. And yet here are we seriously about to tell th public that M. Saint-Hilaire's Letters are most interesting, and tha to laugh at the idea of eating horse-flesh is great folly in these ou days when so many are so unable to answer the daily-recurrin question, "What shall we eat?" and when so many must receiv from charity their daily bread.

Wise and intellectual folk may turn away in affected indifferenc to flesh-pots and creature-comforts. As for ourselves, we are no ashamed to confess that, in Count Rumford's Essays, we have rea

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* *Lettres sur les Substances Alimentaires, et particulièrement sur la Viande (Cheval.* Par M. Isodore Geoffroy Saint-Hilaire, Membre de l'Institut, Pr fesseur de Zoologie à la Faculté des Sciences de Paris, &c. Victor Masson Paris, 1856.

great delectation a most appetite-raising chapter, entitled the pleasure of eating, and of the means that may be emd for increasing it." Moreover, knowing how intimately innded are the moral and the mental with the physical eles of our wondrous being, we subscribe, with a moderate ance due to the *mot* of a wit, to the aphorism of a contempoFrenchman : "Tell me what you *eat*, and I'll tell you what you * *Mens sana in corpore sano* being the perfectibility of n nature in this life, a treatise on the best mode of keeping nd body together—on alimentary substances, in short, is deg of the most careful study, because involving principles for olution and application of which there is required the highest ophy. Starve a man, or maintain him by a minimum expen of nutrition, and what a miserable creature do you make him ! ed in his physical organisation, his mental powers share in the ing debility ; and how readily our moral perceptions sympawith our bodily condition—we all of us occasionally know, disordered health tries our temper and obscures our judg- We therefore assent to this characteristic declaration in f the earliest productions of the benevolent Dr Chalmers : it be remembered that philosophy is never more usefully, and more honourably, directed, than when multiplying the stores nan comfort; than when enlightening the humblest depart of industry ; than when she descends to the walks of busio the dark and dismal receptacles of misery ; to the hospitals ease, to the putrid houses of our great cities, where poverty sits ely and ragged wretchedness, agonised with pain, faint with r, and shivering in a frail and unsheltered tenement. Count ord deserves the gratitude of mankind." This panegyric on Rumford, better known to the scientific world under his sh title of Sir Benjamin Thomson, is abundantly merited. ssays are full of important experiments in nutrition, and from re derived almost all our so-called novelties in modes of heating ntilation, as well as in the construction of cooking utensils of kind. From them the philanthropist will learn with delight on new-year's day, the philosophic Count captured all the ing beggars of Munich, introduced them into a military house, and soon made them fat, happy, and industrious. From also the careful housewife will learn with surprise how truly he poet,

"Man needs but little here below ;"

Bavarian soldier, who is very fond of eating, and whose on is as comfortable as that of any soldier in Europe, lives,

* "Que je sache ce que tu manges, et je saurai qui tu es."

we are told, on twopence a-day; so skilled is he in the science of cookery.

If our old friend Count Rumford deserves to live in the public memory as a benefactor to the human race, because of his benevolent ingenuity in turning to the best account the usual articles of food, M. Saint-Hilaire claims a niche in the temple of fame on account of his eloquent and scientific demonstration of the excellent qualities of a species of food the prejudice against the use of which, in Europe at least, is inveterate, and almost universal. The human stomach is not apt to be sentimental; its bowels, that is, are not greatly pained at the idea of being called on to receive and digest the anatomised remains of an intelligent, laborious, brave, and serviceable animal like the horse; but it is astonishingly apt to be squeamish and whimsical. Hence the strenuous efforts of his Government have only partially induced the white snail-eating Austrian to partake of horse-flesh; and if Louis Napoleon were to declare it his imperial pleasure that Paris should consume a large proportion of this really excellent food, what a dangerous commotion would there be among the frog-eaters on the banks of the Seine!

M. Saint-Hilaire is well aware of the inveteracy of the prejudice which obstructs his philanthropy; for nine years he has exposed its folly in the presence of the enlightened audiences which yearly listen with delight to his lectures in the Museum of Natural History; and so anxious is he to give it the *coup-de-grace*, that for several months he has suspended the publication of his *General Natural History*, in order that he may publish the thoroughly practical work on which we are now commenting. "May it," he exclaims, "be the death-blow to that silly prejudice against which I have been contending for nine years, and against which I shall contend so long as I witness the deplorable spectacle of millions of Frenchmen deprived of animal food; eating it six times, twice, *once* a-year! and in presence of this misery millions of pounds of good meat given over to industry every month for secondary purposes, abandoned to swine and dogs, or even cast into the dunghill."

To know that there are many as miserable as themselves is a kind of comfort. We therefore compassionately remind these distressed Frenchmen, that though to be omnivorous is one of the distinctions betwixt man and the brutes, yet, in fact, only a small proportion of the human race is actually carnivorous; and that for more than sixteen hundred years the entire population of the earth was restricted to a vegetable diet; for not till after the Flood did the Almighty say to Noah and his sons, "Every moving thing that liveth shall be meat for you; even as the green herb have I given you all things."—(Gen. ix. 37). As an additional crumb of comfort for non-flesh-eating Frenchmen, we add, that the idea of "John Bull" living on animal food is unhappily a fiction. "If 'John Bull' means two-thirds of the population, 'John Bull' is living on

table diet, and not more than one-third of him is nourished
neat."* Speaking of the Dorsetshire peasantry, Mr Thorn-
in his work on Over-Population, observes: "As for meat,
of them would not know its taste, if once or twice in the
e of their lives—on the squire's having a son and heir born
im, or on the young gentleman's coming of age—they were
regaled with a dinner of what the newspapers call 'Old Eng-
fare.' Some of them contrive to have a little bacon—in the
ortion, it seems, of a half-pound a-week to a dozen persons; but
more commonly use fat, to give the potatoes a relish; and,
ne of them told Mr Austin, they don't always go without
e." In Scotland, the mass of the people are compulsory
arians, oatmeal and milk being the national fare. Pigs are
by the Scottish peasantry very generally, but often they are not
by their families, but sold, owing to the high price given for
by *Krämers*;† that is, men who go through the country buying
butter, and eggs, for London, and other great cities. Ireland
toriously the land of pigs and potatoes, but unfortunately the
peasant does not eat but sells his pig—"the gentleman that
the rint."

the cold of these northern regions did not sharpen the appetite,
demand the use of fatty substances for the comfortable nutrition
uman beings, the people of the British Isles would have little
n to complain because of being generally restricted to vegetable
small acquaintance with flesh-pots being the lot of the people
st everywhere; a mere fraction of the human race being car-
ous, though furnished with means of masticating and assimi-
g animal food. But with our climate, and with the active
urs required from most of us, the liberal use of animal food is
pensable for the development and maintenance of our bodily
ur. We lately read with amazement of the vegetable fare
y employed by a singularly lusty English blacksmith, a tee-
ler moreover. But how long will his strength endure? We
ch him to meditate on the fate of M. le Docteur Stard, who,
g a philosophical experiment, died, while flattering himself
he was only weakened by a vegetable diet. Let him also medi-
on this novel illustration of the saying that "hunger will tame
n." A lion, fed for many years on milk-soup! was presented
855 to the Menagerie of the Museum of Natural History, Paris.
poor brute was as quiet as a sheep, and so debilitated as to be
xtremis. An instant change of diet was resolved upon. In a
th horse-flesh restored his natural ferocity, and now he is mag-
ent! In constitution, a brose-fed Scottish ploughman is on the

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* ynon's *Arts and Artisans*.

† *Krämer* is in Germany the term for a petty huxter, or small merchant. It is
us to find the word similarly applied in Forfarshire.

verge of old age in his fiftieth year. We invite attention to this fact, and we trust those interested in the public *hygiène* will ponder well the distressing statement that, in some parts of England, scanty nutrition is unfitting the labourer for toil, and by weakening his thews and sinews, incapacitating him for serving his country, either in peace or in war; for guiding the plough, or wielding sword and bayonet. The recruiting officers in the south eastern counties complain that, in size and strength, the peasantry are inferior to those of the north and north-midland counties, and farmers observe the same variation in the amount of labour which they can obtain from their men.* This deteriorated race gives birth to a yet more enfeebled offspring; so that the desire to arrest this degeneration of the physical constitution of the British people should make us give willing ear to such a man as M. Saint-Hilaire when propounding his views on a matter of such importance as that regarding the means of public nutrition.

He discusses, in the first place, the normal laws of nutrition established by Liebig and other eminent chemists, who demonstrate that flesh-eating animals are in general stronger than the herbivorous on which they prey, and that no other substance equals animal food in the production of flesh, and in the reparation of muscular energy expended in labour. Hence the necessity of providing it for the labouring classes everywhere, and especially in northern climates and in great cities. Is it sufficiently supplied? Evidently not. The researches of Lecanu on renal secretion, and the experiments of Dumas on respiration, have shown that, through the kidneys and the lungs, we daily lose 15 grammes of azote, and 300 grammes of carbon. To replace this loss is the function of nutrition. Theoretically determined, science declares that this replacement requires the daily supply of 286 grammes of meat, and 1000 grammes of vegetable matter. This is in remarkable harmony with the daily ration of the French cavalry, fixed on after long experience. The numbers being: meat, 285 grammes; vegetable matter, 126[...] Adopting the lower figures of 228 grammes per day, or 83 kilogrammes a-year, M. Saint-Hilaire demonstrates that this normal rate of nutrition, necessary for the comfortable existence of human beings, is so far from being attained in France, that to arrive at it demands the production of three-and-a-half times more animal food than France actually produces. Instead of 83 kilogrammes, Frenchmen, on the average, only consume 28 kilogrammes of animal food per annum. "The difference between the normal and the actual consumption is enormous," exclaims the Professor, "the deficit immense!" We need hardly inform our readers that he proposes to supply this deficit by the consumption of horse-flesh; 'a reserve for which we need not cross the sea, nor even the frontier

* Thornton on Over-Population.

which is always at hand, and the benefit of which we may have to-morrow if we please to will it to-day."

Whether our learned friend ever heard of the well-known recipe for hare-soup, beginning with, "first catch your hare," we know not. Certain it is that he, very considerately, first informs us where we may find the horses on which he invites us to feed. With most praiseworthy precision he states the relative proportions existing between the various animal products consumable in France; from which it results that the supply of horse-flesh is equal to one-fourth of the animal food consumed at present. "Singular social anomaly, the long endurance of which will one day excite amazement! There are millions of Frenchmen who never eat flesh, while every month millions of pounds of good meat are applied to very secondary uses, or even thrown into the dunghill. Behold what science herself has authorised up to this day, at least by her silence; as if even she were afraid to oppose a popular prejudice, and to open her hand and spread abroad useful truths, which she had in her possession."

"After the question of quantity comes that of quality,"—so begins part second of these interesting Letters. This is the point where our Professor most needs his rhetorical skill, and appeal to facts and testimonies of the enlightened few who, in Europe, have tried Hippophagy. His appeal to our palate is so irresistible that, being about to sit down to dinner, we are heartily sorry at not having the prospect of seeing at our table *vol-au-vents d'amourette* from the spinal marrow of a horse; nor horse-soup, nor horse-pie, *à la mode;* nor a roast of horse-chine,—all of which, we know, were lately received with "explosions de satisfaction" by a party of Parisian *Hippophagi*.

Reasoning from analogy, we should expect little difference in the nutritious qualities of the flesh of the horse and the ox. Like our best butcher-meat animals, the horse is herbivorous. The only notable difference is the greater amount in the flesh of the horse of the principle of *creatine;* that nitrogenous substance discovered in 1833 in beef-soup, by Chevreul, who has found it in all the vertebrate animals, and which, according to Liebig, plays an important part in almost all vital actions. This excess of *creatine* should add to the alimentary value of horse-flesh. Theory and experiment are on this point in happy union; and M. Saint-Hilaire quotes varied and most competent testimony showing its superiority. We can only refer to the experience of the illustrious surgeon Larrey, who thus sums up his long and distinguished practice in camps and hospitals:—

"I have very often, *and with the greatest success*, given horse-flesh to the soldiers and the wounded of our armies. In several of our campaigns on the Rhine, in Catalonia, and the maritime Alps, I caused it, under various circumstances, to be given to our soldiers; but, above all, we found the very great benefit of this meat during

the siege of Alexandria in Egypt. Not only did it save the lives of the troops defending that city; it *powerfully contributed to the cure and invigoration of the numerous sick and wounded in our hospitals, and likewise aided in the removal of a scorbutic epidemic which seized the whole army.* There was a regular daily distribution of this meat; and most fortunately the number of horses was sufficient to bring the army up to the time of the capitulation. These animals, of the Arab breed, were extremely thin, owing to the scarcity of fodder, but they were generally young. In order to overcome the prejudice of the soldiers, I was the first to kill my horses and eat this food.

"After the battle of Esslingen, shut up in the island of Loban, with the greater part of the French army and about six thousand wounded, I caused soup to be made of the numerous horses scattered over the island, and belonging to the generals and superior officers. The breastplates of those dismounted, and of the wounded, served as coppers for cooking this meat; and, instead of salt, of which we were destitute, it was seasoned with gun-powder. I only had the trouble of pouring the soup from one breastplate into another through a linen cloth, and of then allowing it to clarify by rest Marshal Massena, commander-in-chief of the troops, was righ glad to share in my repast, and was very well pleased with it Experience thus demonstrates that horse-flesh is most proper nourishment for man."

Oh that this had been remembered in the Crimea! We shoul never have heard of the sufferings of the wretched horses whic crunched each other's tails; and many a sick and wounded ma might have received that nourishment for want of which he pine and died on the bleak plateau around Sebastopol. In the debat on the Crimean Commission, in the House of Commons, on th 12th March, General Peel, speaking of the want of forces for th making of a road from Balaklava to Sebastopol, observed, that " had originated from the impossibility of finding forage for mo than a certain number of animals in the Crimea, and that numb was already exceeded by the horses of the cavalry, the artillery, an others. The common-sense view would have been to reduce th number of horses to the power of feeding them. The proper cour would have been to have re-embarked a portion of them." Not hoof of them, say we. They should have been slaughtered an eaten, instead of being permitted to die by inches, and their carcass to diffuse the odour of the most fetid corruption in the vicinity over-wrought, under-fed, sick and wounded men. What was ex cellent food for Frenchmen would have been equally good for Britis troops; and if Massena and Larrey thought horse-flesh dainty fa when seasoned with gunpowder, we are very decidedly of opinio that General Peel would have no reason to complain were he doome for a few months to a dietary such as nerved the French defende

exandria, and the isolated troops in the isle of Lobau. The
usion of the distinguished Parent-Duchâtelet, the highest
rity in all that affects the public health, is in these words:—
s kind of food was very good and much sought after in ancient
. It has not changed its nature, and it is as suitable for
rn stomachs as it was for those of our ancestors; for stomachs
g and healthy, but also for the sick and wounded, whose
gth it restores, and whose convalescence it confirms. And it
necessary that the animals should be fat, or that they should
never suffered, as some may suppose; for beneficial effects
be obtained from horses extremely emaciated by famine." So
we are not amusing our readers with the unprofitable talk of
e *littérateur*, but communicating the knowledge of facts, by
pplication of which the wants of the poor may be supplied,
ck and debilitated be restored and invigorated, the health of
s be maintained, battles be won, and prolonged sieges be
ed.

t "what is the *gout* of horse-flesh?" Have patience, courteous
rs, and we shall make your teeth water! Horse dinners *vulgo*,
uets hippophagiques in Parisian phrase, have been quite
ogue of late in Paris, Kœnigsbaden, Wirtemberg, Weimar,
ch, Vienna, Dresden, and many other places; many of those
ermany being by public subscriptions. Those in Paris have
especially *recherchés*, and attended by such a variety of dis-
ished guests as to elevate them to the rank of scientific ex-
ients. Though in possession of the culinary triumphs of the
an *Hippophagi*, we shall spare our readers the recital, and
them instead an account of a Parisian "horse-dinner," from
raceful pen of the witty *M. le Docteur Amédée Latour*, who
care to inform us that it was not written on his rising from
but twenty-fours after, when, he solemnly depones, he was
ing not the least digestive remorse. "The experiment begins.
enault has most intelligently made the arrangements. Side
le are the subjects to be experimented on—the matters to be
ared.

"Horse-soup—Beef-soup.
Horse-boil—Beef-boil.
Roast-horse—Roast-beef.

he same quantity, the same sort—judge and compare—nothing
.

Horse-soup—general astonishment! It's perfect! it's excellent!
eding! it's like venison! it's aromatic! it's rich-tasted! it's
-rate and admirable soup!

The *beef-soup* is good, but comparatively inferior, of less marked
less flavoured, less tasty. The jury unanimously find that the
yields soup of superior quality, that it is impossible to distin-
the taste of it from that of the richest beef-soups, and that

persons not warned could not find out the difference. The same colour, the same clearness.

"*Boiled-horse*—the flesh is browner than beef; it is drier, and less resisting under the teeth; no particular taste; it is the taste of boiled-beef, but not of the first class. I have eaten better beef, but also much worse. Upon the whole, it is very eatable; poor people who buy inferior beef, or cow-beef, would find a very sensible difference in favour of boiled-horse.

"*Roast-horse.*—It is the chine of the animal slightly salted, and highly spiced. An explosion of satisfaction! *Nothing finer, more delicate, or more tender.* The fillet of venison, whose aroma it recalls, is not its superior. *It's perfect in all points.*

"Summing up: *Soup—superior*
Boil—good, and very eatable.
Roast—exquisite.

"Is not this a very interesting experiment?"

Truly yes, say we. And here is another, rather comical. M. Saint-Hilaire is President of the Society of Acclimatation. Having invited a member of this society to taste of *a kind of meat undoubtedly new to him,* the learned doctor thought his opinion was sought for in regard to some rare and newly introduced animal; and so, after having duly tasted it, he gave it thus: "In my opinion it is of *the utmost importance* to acclimatise this animal." It was horse-flesh!

These things being so, how comes it that there is such a prejudice against such a valuable article of food? Our Professor hunts down this prejudice wherever displayed. He first falls foul of certain Chinese doctors who have interdicted the use of horse-flesh in their much-admired production, *Chi-wou-pen-thsao-hoei-tsouan.* And certainly he does make mince-meat of these poor Chinese, who, in the plenitude of their wisdom, declare that to eat of a *white* horse with a *black* foot, or of a *white* horse with a *black* head, will make a man mad. These worthies also teach that to hang up a monkey in a stable is an infallible preventive of all horse-diseases.

In reference to European prejudice, M. Saint-Hilaire remarks: "One cannot directly attack, as I have attacked, an old idea without encountering the warmest opposition, any more than you can pull up a deeply-rooted tree without vigorous efforts." And so he rides his hobby with a firm seat, and is as little daunted by the folly of fools as by the sneers of witlings, or the objections of reasonable people. He discusses with much dignity and good temper the objections of his learned friends, MM. Valenciennes and Milne Edwards, and proves that they are in error when supposing that only the flesh of young horses is good, inasmuch as most satisfactory meals have been made upon animals from seventeen up to twenty-five years old. To certain objectors, to whom he declines to apply the epithet *savants,* who allege that the public sale of

horse-flesh would excite among those using it a feeling of ill-will against the consumers of superior butcher-meat—such as beef, veal, and mutton—he says: "Why not on this principle renounce also butcher-meat? Those who only eat beef might be jealous of those who eat poultry and game." As to the rise in the price of horse-flesh, and the consequent limitation in the use of it when its consumption shall become general, it is argued that it will be long before this happens; and that, when it does happen, it will be a public benefit, by reducing the price of butcher-meat. One fourteenth of an addition to the meat consumed at present will infallibly arrest that rise in the price of meat, of which in France there are such complaints. As to the jokes of a portion of the press, our philosopher laughs when they are witty; when heavy he heeds them not. *Telum imbelle sine ictu.* A certain religious journal is afraid that eating of horses must end in eating of men! "When all the horses are slaughtered, men must eat one another." Our Professor looks very grave on being thus accused of preaching *Anthropophagy!* As to the sentimentalists who declaim against slaying and devouring an animal which is our friend, companion, and servant in our labours, pastimes, and wars, their whining is disposed of by the fact that the horse-eating movement is mainly supported by the societies instituted for the prevention of cruelty to animals. It is undoubtedly more merciful to fatten an old horse, and then eat him, than to work him till he is a moving skeleton, a mass of sores, a sight so piteous as to call forth the indignation of every rightly-constituted mind. Those savage abusers of a noble animal, who torture and starve the horse, may not listen to your humane interpositions in its behalf; but they will hear you when demonstrating that it is their interest to send their horses to the knackers in tolerable condition; because as they (*i. e.* the horses) are to be eaten, it is manifest that while a skin full of bones may be worth five shillings only, a much higher price will be given for a horse tolerably plump.

The public sale of horse-flesh in Paris being prohibited, the removal of the prohibition is strenuously contended for on the very sensible ground that at present it is largely consumed through clandestine methods: introduced through the barriers ostensibly as food for animals, and often thrown over the walls at night, it is distributed afterwards among *restaurants*, tippling-houses, low eating-houses, and houses of bad fame. Of course, it is not subject to that inspection which ensures the salubrity of the butcher-meat sold in the markets, and so these houses are very often so many charnel-houses and sources of infection. These reasons for the legalised sale of horse-flesh apply as much to London and our great cities as to Paris.

In order to give a practical turn to this discussion, such as may be looked for in the "Journal of Agriculture," we conclude with telling our farming friends that the experience of our French neigh-

bours is decidedly favourable to the use of horse-flesh in the fattening of pigs; and that the apprehended danger to the public health from these animals feeding on diseased horses has been found unreal. At the piggery of Alfort, the Council of Health reports that about a hundred and fifty pigs of different species are fed on raw horse-flesh, diseased or healthy, without distinction, and that the most learned Professors in Europe, hundreds of pupils, and thousands of inquisitive visitors, constantly inspecting this establishment, have failed to detect any injurious result.

In conclusion, we protest against the senseless waste of horse-flesh which has hitherto prevailed; we invite public trial of its qualities; we long to taste the horse delicacies which have such charms for palates accustomed to the refinements of the Parisian *cuisine;* and in order that our readers may have some idea of the ability of the Scottish farmer to meet the demands of those we convert to *Hippophagy*, we beg to add that, according to the agricultural statistics for 1856, there were in Scotland very nearly a hundred and eighty thousand horses. And M'Queen's statistics inform us that in the British empire there are 2,250,000 horses, valued at £67,000,000. A very considerable proportion of these should be eaten. Malformation, incipient disease, accidental injuries, render it more profitable to kill veal than to rear, at great expense, animals incapacitated for labour. For example, a young horse in our neighbourhood met with an irremediable dislocation. Slung up for several months in hope of relieving the injured limb, the poor animal retained its appetite, but showed no improvement in its power of locomotion. By our advice—not disinterested, certainly—for we looked at it with the eye of a Hippophagist—it was shot at last, and, we grieve to add, buried; for our friend the farmer, thinking us facetious, forgot the promise we extorted from him to send us a haunch! In like manner, a carriage-horse and a cart-horse, accidentally injured in our neighbourhood, were shot and buried. In the name of all that is eatable, why this waste? Send an injured or enfeebled horse to grass, and in four months he will be fat and fit for the table. In answer, therefore, to our next query, "Should we eat our horses?" we reply, "Under certain circumstances, undoubtedly;" and in no case ought we to bury the flesh of the horse, when we have the strongest reasons for regarding it as alike nutritious and palatable. Owing to the great value of the horse, the use of its flesh, as an article of human food, must in this country be limited. Let us, however, avail ourselves of it so far as practicable; and, in order that it may no longer be wasted, let us dismiss the silly prejudice which causes even a half-starved labourer to exhibit irrepressible disgust when exhorted to partake of a kind of food occasionally within his reach, and known to possess in abundance those elements of nutrition so scantily supplied by the common fare of the working-classes. E.

THE FARMERS' NOTE-BOOK.—No. LVII.

osure of Farmyard Dung spread on the Surface of the
·Professor Voelcker, in his instructive and elaborate essay myard Manure, advanced some opinions which are certainly iance with those held generally by practical men. The however, by which he arrived at these conclusions, after his ve researches on the subject, were sufficient to arrest the on of the farmer, and to evoke the inquiry as to whether the l practised by him was the best. The Professor states: ll soils with a moderate proportion of clay, no fear need be ined of valuable fertilising substances becoming wasted if nure cannot be ploughed in at once. Fresh and even well-dung contains very little free ammonia, and since active tation, and with it the further evolution of free ammonia, ped by spreading out the manure on the field, valuable manuring matters cannot escape into the air by adopting in.

all soils, with a moderate proportion of clay, possess in a able degree the power of absorbing and retaining manur-tters, none of the saline and soluble organic constituents sted even by a heavy fall of rain. It may indeed be ques-whether it is more advisable to plough in the manure at r to let it lie for some time on the surface, and to give the ll opportunity to wash it into the soil.

appears to me a matter of the greatest importance to regu-e application of manure to our fields, so that its constitu-iay become properly diluted, and uniformly distributed st a large mass of soil. By ploughing in the manure at t appears to me this desirable end cannot be reached so ly as by allowing the rain to wash in gradually the manure spread on the surface of the field.

adopting such a course, in case practical experience should by theoretical reasoning, the objection could no longer be ined that the land is not ready for carting manure upon it. uch inclined to recommend as a general rule: Cart the on the field, spread it at once, and wait for a favourable inity to plough it in. In clay soils I have no hesitation to e manure may be spread even six months before it is ed in, without losing any appreciable quantity of manuring "

essor Voelcker makes some exceptions to this general rule, as, ance, the advantage of ploughing in long dung on clay soils, so ep them more open, and bring them more under the influence . "All he wishes to enforce is, that when no other choice out either to set up the manure in a heap in the corner of

the field, or to spread it on the field without ploughing it in directly, to adopt the latter plan."

This is no doubt contrary to the opinion and the practice of most practical men. We must, however, read the Professor's words in a limited sense, when he speaks of exposing dung on the surface of the soil for six months. We must suppose him to mean that it would be advisable to do this only during the winter months, when more rain falls, and the temperature is low. It is not our intention at present to controvert his opinion even in its most limited sense, but, on the contrary, to adduce an experiment performed at Eldena, the results of which are decidedly in favour of it.

There being a difference of opinion among scientific men regarding the advantage of spreading dung on the surface, and leaving it exposed for some time before covering it in, Professor Legnitz of Eldena had recourse to experiment for the solving of the question. For this purpose he selected 2¼ roods, which he divided into four equal parts. To No. 1 no manure was given No. 2 received about two tons of farmyard dung, which was spread immediately, and covered in by means of the plough. No 3 was treated in the same manner, with this difference, that the hoe was used instead of the plough. The same quantity of dung was carried to No. 4, and allowed to remain spread for three weeks on the soil before being covered in by the hoe. On the 10th of October the four lots subjected to experiment were sown with about 95 pints of rye-seed each. The following are the total results of the crop from each lot, grain and straw included:—

No. 1	produced	583	lb.
„ 2	„	770	„
„ 3	„	818	„
„ 4	„	935	„

We do not by any means consider this experiment conclusive as there are several particulars not mentioned, such as the state o the weather when the dung was lying exposed, and the kind o soil, but which we would have liked to have seen stated. Still i is striking enough to warrant a repetition of it on a larger scale and we hope that some of our practical friends will undertake it.

Adoption of a Dog instead of its Foal by a Mare.—A thoroug ..ed mare belonging to a gentleman in Mid-Lothian was expecte o foal on the 25th of last June. On the 8th of June she wa ..served to be unwell, showing great stiffness and pain in th egs, and cold generally all over the body. The udder was di ended to an unusual size with milk, and there was wax at th eats; there was not however, the least loosening of the ligatur [illegible] everything was as close and firm ther

s if she were not in foal. The owner thought it advisable to ll in a veterinary surgeon, who bled the mare, and gave it as is opinion that she would not foal for ten days at soonest. She as tied up in a stall till the wound would be healed, and was atched day and night. In the same stable with her were an- her horse, and three terrier dogs which lay under the mangers, ie or two of them always being under her manger, for which she ntracted a liking.

On the 10th June she showed no uneasiness or symptoms what- 'er of foaling. The person in charge of her, however, having casion to leave the stable for an hour in the afternoon, was sur- ised to find on his return a lively foal tumbling about the stable, id the mare quietly eating. Assistance was immediately pro- red; the mare was loosed and brought to the foal, which was rried to a loose-box, with her close behind it. The foal, though iall, was very spirited, and was soon on its legs gamboling about e house, and always attempted to get near its mother. She, on e other hand, positively refused to have anything to do with it, id every time it approached her, rudely pushed it away, so much as to alarm those who were in charge that she would injure it. iis continued for several hours without any apparent change in r feelings towards the foal. There being an abundant flow of ilk from her, the twitch was put on so as to allow the foal to suck ittle. While in the loose-house she always showed great restless- ss, and looked impatiently at the door, as if expecting something. It was thought that, by removing her to the stable again, she uld more readily adopt the foal. This was accordingly done; e foal was carried and laid where it was first found, and the ire allowed to go loose. Another horse was in the stable, iich was three-stalled. Immediately on entering the stable she gan to smell along the floor, apparently in the tract taken by e foal before it was discovered. This she continued to do till e reached one of the dogs, which was lying under the manger the stall usually unoccupied, and which it was thought, though could not be positively asserted, was lying under her manger en she foaled. She disregarded the foal lying in the same ll, and evinced the most lively satisfaction at meeting with the g, uttered fond maternal neighings to it, licked it, and itly pawed it as if wishing it to rise. The dog not relishing se unaccountable caresses, retreated to another stall, whither was immediately followed by the mare, which continued to w manifestations of affection for the dog. Care was always en to have the foal presented to her when she was standing r the dog. She did not show the same dislike to it then, but l her indifference to it was every now and then evinced by hing it away when it came between her and the dog; and if dog was in one stall and the foal in the other, the mare

remained with the dog, and totally disregarded the anxious cries of its own offspring.

All the dogs were then removed from the stable, and the poor foal was as little thought of as it was in the loose-box; but was kept close before the mare, with a man in attendance to prevent its being injured by her. And every two or three hours the twitch was applied and the foal allowed to suck, the mare being made to understand that the relief she felt from the drawing of the milk was given by the foal. After some hours' absence, the adopted dog accidentally entered the stable, when the mare, on seeing it, became quite frantic to get near it, wreaking her vengeance on the foal by knocking it over. This accident, however, was prevented a second time by closely confining the dogs in a separate house. By degrees, as the milk accumulated on her and evidently gave her pain, of which she was relieved when the foal sucked her, she took more kindly to it. Gradually the use of the twitch was dispensed with, and she allowed the foal to suck without any interference whatever; and in twenty-four hours after she foaled the trouble spent on her was amply rewarded by her adopting the foal, and becoming so fond of it as not to allow it for one instant to be out of her sight, and to show her displeasure if any stranger came too near it.

It was not thought advisable to remove the other horse from the stable, as in cases where mares refuse to take their foals, their maternal feelings have sometimes been quickened by the presence of another horse. As we never heard or read of such a curious case of adoption, we have thought it proper to be more than usually minute in our description of this one. We have often seen ewes, bitches, and cats, when near parturition, adopt lambs, puppies, and kittens, which happen to be near them; but we never heard before of an animal refusing to acknowledge its own offspring and adopting another animal of a different genus.

English v. Scotch Threshing-Machines.—Public attention has been directed of late to the English threshing-machines which have been introduced into Scotland. The minds of Scotch farmers were prepared for some great improvements in those to which they have long been accustomed. The methodical exactness to which all operations in agriculture have of late years been subjected—the spirit of inquiry abroad as to the most perfect forms of implements and machines in use, and the best way of performing different kinds of work—as to the most profitable varieties of manures to be used, and of crops to be grown—in short, as to how agriculture could be best improved so as to allow the farmer to pay a fair rent to the landlord, a liberal wage to the labourer, and have a reasonable profit to himself for the skill, the capital, and the labour expended, soon opened the eyes of the farmer to

many defects both in his system and in his machinery. He soon saw that the threshing-mills, which were considered efficient enough when the crop was cut down by means of teethed-hooks, and every head of the grain laid in its proper place, were sadly at fault when the scythe and scythe-hook came into use to reduce the expense of harvesting. The Scotch machine-makers were applied to, who made changes on the old mills, some of which were improvements, others mere alterations. Without due inquiry into the cause of the inefficiency of the machines, they endeavoured to make improvements on those constructed on the old principle. The English machine-makers, however, not contented with adopting the Scotch mills as models, set about trying to construct a machine which would be more suited to the advanced state of agriculture. Whether they have succeeded or not is for the public to determine, as both forms of threshing-mills are now, we may say, brought daily into competition in the Lothians.

We do not wish any one to consider the following particulars of experiment as conclusive, either for or against either form of machine. The particulars were noted more with the view of giving the owner of the Scotch mill some approximation to the truth, and of aiding him in deciding as to whether it would be more profitable to him to improve his present mill or purchase a new English one. It may be mentioned that the Scotch mill, though not of the newest construction, is reckoned a fair average one, and having only one large shaker, a man being placed at the heck, whose whole duty is to shake the straws whenever any kind of grain is threshed. We have heard it asserted by some who have added a second shaker to such a mill, that there was not by any means such an improvement from the addition as they expected; and this information, coupled with the reports of the superiority of the English mills, has hitherto prevented the owner of the Scotch mill from making such improvements in his mill as he would otherwise have done.

The threshing-machine made by R. Hornsby and Sons, which gained the premium at the Highland Society's Show at Glasgow, was engaged to thresh out some stacks of wheat of last year's growth. It threshed at the rate of five quarters per hour, including stoppages; and at particular times, when it was fed equally and fast, it did at the rate of seven quarters per hour, the work being unexceptionable. To test its efficiency, sheaf about of one of the stacks was driven to it and to the Scotch mill on the premises, which threshed at only half the speed in ordinary cases, that is, at the rate of 2½ quarters per hour. We may state that the Scotch mill has none of the modern appliances, such as elevators, &c., attached to it, but the grain is well dressed by means of detached fanners, driven either by the hand or by water. The wheat threshed yielded at the rate of 36 bushels per imperial acre.

The following are the results :—

	Good Grain.			Light.	Weight of Good and Light.
	Bushels.	Weight per Bushel.	Gross Weight of Good.		
		st. lb.	st. lb.	st. lb.	st. lb.
English Machine,	28	0 62¼ and 3 9	128 9	4 10	133 5
Scotch Machine,	28	0 60¾ and 2 1	123 8	5 4	128 12

The difference, it will be observed, is equivalent to a bushe good grain in favour of the English machine; that is, 1 bu for every 28 bushels, or about 3½ per cent.; or a farmer thresh this crop of 36 bushels per acre with the English machine wc obtain a yield of 1⅛ bushel more per acre than if he used Scotch one. We need not say that by such a difference in weight per bushel of the wheat obtained from the English mach over that got from the use of the Scotch one, the superiority of former in dressing of the grain is shown over the latter. We served but little of the grain broken by the English machine.

What became of the grain which was not got when the thr ing was performed by the Scotch mill? To answer this quest we put through the English mill some straw that had been thres some time previous by the Scotch mill, and after a quarter of hour's work obtained 52 lb. of wheat. It was also thought ac able to test the efficiency of threshing of the English Some of the straw, therefore, that had passed through it was m to pass through the Scotch machine, and, after five minutes' w 1¾ pound of wheat was obtained. In both instances, before straw was passed through, the mills were allowed to empty th selves for some time till they were quite clean. But we see f this last experiment that even the premium machine does separate all the grain from the straw, so that there is still r for improvement on it.

From the foregoing results, we are inclined to conclude that English mill threshes cleaner, dresses better, and does not b the straw so much as the Scotch one, but that it does not tot separate the grain from the straw. It may justly be urgec favour of the Scotch mill that it had been long in use, and th ore could not be expected to perform its work so well as English one, which had only been used two or three times be: ar been got up for competition, and consequently might be osed to have its parts more than usually better adjusted, and workmanship in general superior in character. A decided ol ... that it does not th ... beans, while the Scotch mac

threshes all kinds of crop usually grown on the farm. We thus see that neither of the machines is perfect, and that there are therefore grounds for encouraging our Scotch threshing-mill makers to exert their skill and genius in introducing such improvements as to bring them nearer perfection. We are aware that there are some of our millwrights who consider the machines made by them quite perfect, and incapable of improvement by borrowing any piece of mechanism from the English mills. Let them remain in this state of blissful self-satisfaction, encased in their prejudices; but sooner or later they will be roused from the state of their fancied superiority, by finding that Scotch farmers, being determined to supply themselves with implements and machines which can perform the work in the most efficient manner, and not obtaining such among the neighbouring millwrights, have been obliged to cross the Tweed to get what they want.

Transport of Milk in warm Weather.—At the meeting of the Société Centrale d'Agriculture of 14th June last, M. Charlier, a veterinary surgeon, laid before the members a vessel of tin inveloped in a thick covering of wool, which he uses for the purpose of carrying sweet milk from the country to Paris in the hottest weather. M. Charlier has invented a method of castrating milk cows, to justify the utility of which operation he has established in Paris a depôt for the sale of the milk from those animals which have been operated on, and which are called *Bœuvonnes.* The farm on which these animals are kept is situated about 100 miles from Paris. Formerly he used for transporting the milk, vessels made of malleable iron, closed by means of an iron stopper forced down by a stroke from a hammer, so as to impress the liquid and prevent any movement of it in the vessel. But it was found impossible to preserve the sweetness of the milk after being carried such a distance in summer. To remedy this, M. Charlier applied a process, well known before to both scientific and practical men, to the preparation of the milk for the journey. Immediately after the milk is drawn, it is confined in very long tubes, which are plunged into cold fresh water, so as to reduce the temperature of the milk to 12° or 13° centigrade. It is then quickly decanted into the vessels of tin, which are covered with woollen cloth well soaked in water. In this way the milk has been brought to Paris in the warmest weather without any change of temperature in it.

Zizania Aquatica.—The Wild Rice of the Canadian Lakes.—Although noticed by Loudon, Lawson, and other agricultural writers, in their descriptive enumeration of Cereal Grasses, the *Zizania aquatica* has never had that attention bestowed upon it by British cultivators which it seems to deserve. The former author, in his *Encyclopædia of Agriculture*, states "that it grows

in great luxuriance, and produces abundance of bland farinaceous seeds, in all the shallow streams of the dreary wilderness in North-west America, between the Canadian lakes and the hilly range which divides Canada from the country on the northern Pacific Ocean. Its seeds contribute essentially to the support of the wandering tribes of Indians, and feed immense flocks of wild swans, geese, and other water-fowl, which resort there for the purpose of breeding." And the same author, quoting from Pinkerton (*Geog.* vol. iii., p. 330), adds that, "productive as is this excellent plant, and habituated to an ungenial climate, and to situations which refuse all cultivation, it is surprising that the European settlers in the more northern parts of America have as yet taken no pains to cultivate and improve a vegetable production which seems intended by nature to become at some future period the *bread-corn of the north.*" Pursh, in his *Flora Borealis Americana*, published in 1814, describes the *Z. aquatica* as being frequent in shallow waters, from Florida to the Canadian lakes. While modern authors mention it as being more common to the north than to the south *of Lakes Ontario and Erie*, they affirm that it is found, in the greatest profusion and luxuriance, on both sides of the British and United States boundary line of 49° N. lat., in the innumerable lakes of that vast central plain in which are all the head waters of the great river system which finds an outlet in the Gulf of Mexico, through the Missouri and the Mississippi; into the Atlantic, through the great lakes and the St Lawrence; into Hudson's Bay, through Lake Winnipeg, the Saskatchevan, and the Neilson Rivers; and into the Arctic Ocean by the Mackenzie River. In this central region Schoolcraft estimates the number of lakes at about 10,000, which, according to Oliphant (*Minnesota*, p. 204), "fall principally under two classes, those with clean sandy shores and a considerable depth, and those with marshy margins and abounding in wild rice. The former yield various species of fish; the latter serve not only as a storehouse of grain for the natives, who gather it in August and September, but they invite myriads of waterfowl into the region, and thus prove a double resource to them." The wild rice seems never to have formed an article of regular commerce in the American cities: yet it is invariably deemed an acceptable rarity by the citizens, and a looked-for present from friends returning in the "fall" from its native localities. It is generally harvested by the Indian squaws, who collect it into their canoes, by bending over the stems [illegible] thrashing out the seeds with their paddles: the seed is [illegible] husked or prepared for use by a further [illegible] heating, and winnowing. According [illegible] principal and agreeable food of a [illegible] 55, in their journey from that city [illegible] scattered stations on the North Red [illegible] vest [illegible] Lake Superior, where they

readily procured it in a clean or husked state at five shillings currency, or about four shillings sterling per bushel. The wild rice bears no resemblance to the common rice (*Oryza sativa*) or any of its varieties, other than in name and aquatic growth, but approaches nearer in appearance to oats than to any of the other cereal grasses; hence the mixed breeds, the "Voyageurs" of the West, call it *Folle avoine*, or false oat; and *Water oat* seems to have been the name applied to it by some of its earliest discoverers, one of whom, the Baron La Hontan, Lord-lieutenant of the French colony of Newfoundland, who in 1689 published an account of discoveries made by him the preceding year in the then almost unknown region west of Lake Michigan, wherein he states, that on ascending "the river of Puants" (Fox River), he "passed through the little lake of the Malominis, the sides of which were covered with *a sort of oats* of which the savages reaped plentiful crops. Like the cultivated oats, wheat, rye, &c., the wild rice is of annual duration, and is surpassed by none of these in rapidity of growth, attaining, in the summer months, to heights of from 6 to 10 feet above the surface of the water; and thus converting immense districts of river and lake shores into thick fields of waving verdure, not unlike the reed grounds in some of our British rivers. Such places, being well adapted for concealment, and easily penetrated by the light bark canoes of the Indians, are often referred to by American novelists in their descriptions of the strategic warfare of the aborigines.

That the *Z. aquatica* will be found suited for the climate of Britain may be fairly presumed, seeing that, although (according to Johnston's Physical Atlas) the *Isotheres*, or line of summer mean temperature, corresponding with central Britain, passes considerably northward of Lake Superior, yet it does not exceed the northern limit of its native growth. While the line representing the northern limit of vine culture, corresponding with Paris, passes at least 7° south of Lake Itasca, the source of the Mississippi, and of the Great Savannah on the St Louis, which is described in Oliphant's *Minnesota*, page 182, as a boundless swamp, covered (when he and his party visited it, about the 12th of August 1854) with wild rice, the stalks of which were ten or twelve feet high; and the seed, being quite ripe and very sweet, they amused themselves in plucking the ears and eating their contents as they pushed their canoe slowly along through the small channels, in which the rice was often so thick that paddling was impossible.

The *Canadian rice* is said to have been grown successfully many years ago in a pond of the Chelsea Botanic Gardens from seeds brought from America in water; and in Scotland, its culture was essayed by those eminent promoters of horticulture, the late Dr Neill and the late Sir G. Mackenzie of Coul, in Ross-shire, but without success, the seeds having apparently lost their vitality in their transmission from America. Hence it was supposed that their

growth could only be insured by having them brought home in water or mud. A later experiment has proved this opinion to be fallacious. Dr Neill obtained a second sample in 1837, which was sown in a 6-inch flower-pot in his greenhouse aquarium, with another aquatic plant, seemingly with no better success than had attended the former attempt; but the other plant having grown, the pot remained undisturbed. In the second year the wild rice came up, strong and vigorous, and produced flowers and seeds in the course of the summer and autumn. The seeds were not very abundant, which may be accounted for by the contracted root-room afforded by the pot, the plants having scarcely attained a height of eighteen inches. This fact proves that the dryness acquired by the seeds in their transit from Canada had not destroyed their vitality, as might have been inferred from the results of the first experiment, but had simply retarded its development.

After many fruitless endeavours, having at last succeeded, through the kindness of Mr Robert Maitland of Toronto, in procuring a bushel of unhusked seed of the *Z. aquatica*, from Rice Lake in the Newcastle district of Canada West, I have placed a portion of it at the disposal of Messrs Peter Lawson & Son of Edinburgh and London, the Queen's Seedsmen, &c., and distributed the remainder in various parts of the country, among persons likely to take an interest in its culture. I am of opinion that the seeds should be sown without delay, on the margins of lakes or sluggish streams; and in order to insure their sinking in water, they may be rolled in pellets of clay. I would also recommend that they be subjected to as varied treatment as possible, even sowing some in flower-pots and hot-house tanks, where practicable. When the seeds are ripe, let them be sown immediately by the sides of lakes, ponds, or rivers, so that the natural period may be secured for their brairding.

W. GORRIE.

PRESTON HALL, FORD, BY DALKEITH,
January 1857.

On Urea as a direct Source of Nitrogen to Vegetation.—We have much pleasure in inserting the following experiments performed by Dr Cameron, and detailed by him in an essay read before the British Association. The experiments are valuable to the farmer, as showing that the urine of animals may be applied in its fresh state with advantage to the land, thus doing away with the necessity of making expensi[illegible] tanks for keeping the urine till it has under-
[illegible] hitherto been held indispensable
[illegible] he farm has been applied in a
[illegible] have proved that it may be put
[illegible] which will receive the benefit of the nitrogen
[illegible] nitrogen has been converted into am-
[illegible] a change which [illegible] is generally thought

it was necessary for it to undergo, before it could be of any use to vegetation :—

Four earthenware basins, each 2 feet in depth, and 2½ feet across, were filled with fragments of felspar, of different degrees of fineness ; the coarsest fragments being placed lowest. In each of these basins 60 grains of barley were sown on the 5th May. The basins were then numbered 1, 2, 3, and 4, and in each was placed a portion of an artificial manure, containing the following substances—viz.

The double silicate of potash and soda, precipitated carbonate of lime, hydrated sulphate of lime, freshly precipitated, phosphate of lime, phosphate of magnesia, and chloride of sodium. The bases and acids in this compound were in such proportion as nearly to correspond with the composition of the ash of the barley plant. In addition to the above-mentioned substances (which, it will be observed, contained no nitrogen), a solution of urea was applied thrice in each week to basins Nos. 1 and 2, and a solution of sulphate of ammonia to No. 3. No. 4 was intended as a check upon the experiments with the urea, and to it, therefore, no nitrogenous substance was applied. All the basins were covered with glass shades ; the air supplied to the interior of each being freed from ammonia by treatment with dilute sulphuric acid.

The urea used in my experiments was prepared by the following process :—

28 parts of dry ferrocyanide of potassium and 14 part of peroxide of manganese, thoroughly mixed, were heated to dull redness. The resultant mass, after cooling, was treated with cold water, and the solution thus obtained mixed with 20.5 parts crystallised sulphate of ammonia ; sulphate of potash and cyanate of ammonia were formed, and the latter, on the application of a gentle heat, was converted into urea. I did not separate the sulphate of potash, as its presence did not interfere with the results of the experiments.

The barley experimented on was the variety known as *Chevalier* barley. The growing plants were supplied with carbonic acid gas and carbonated distilled water. The plants were thinned at an early stage of their growth, so that there remained but 15 plants to each square foot of surface.

The felspar in basins Nos. 1 and 2 was occasionally washed with distilled water, and the washings tested for ammonia. I did not, however, in any instance, detect the presence of this substance, which proves that the urea was not converted into ammonia.

The results of the experiments are as follow :—

No. I. Period of complete germination—within 5 days.
Period of ripening—within 107 days.
Mean height of plants, including the ears—29 inches.
Average return from the seed—9 stalks.
Average produce in seed—28 grains from each stalk.
Size of grain—14,786 to the pound.
Amount of nitrogen in 100 parts of the dried grain—2.470.

No. 2. Period of perfect germination—within 6 days.
Period of ripening—within 112 days.
Mean height of the plants, including the ears—26 inches.
Average return from the seed—10 stalks.
Average produce in seed—27 grains from each stalk.
Size of grain—13,672 to the pound.
Nitrogen in 100 parts of the dried grain—2.385.

No. 3. Period of complete germination—within 8 days.
Period of ripening—within 105 days.
Mean height of the plants, including the ears—22 inches.
Average return from the seed—12 stalks.
Average produce in seed—25 grains from each stalk.
Size of grain—15,607 to the pound.
Amount of nitrogen in 100 parts of the dried grain—2.385.

No. 4. Perfect germination took place within eight days, and stalks, on the average, 8 inches in height were produced; but in no instance were seeds developed.

The following conclusions are, I consider, deducible from the results of my experiments:—

1. That the perfect development of barley can take place, under certain conditions in soil and air, free of ammonia and its compounds.

2. That urea, in solution, is capable of being taken, unchanged, into the organism of plants.

3. That urea need not be converted into ammonia before its nitrogen becomes available to promote the process of vegetation.

4. That the fertilising effects of urea are little, if at all, inferior to those of ammoniacal salts.

5. That there exists no necessity for allowing drainings or other fertilising substances containing urea to ferment; but that, on the contrary, greater benefits must be derived from their application in a fresh or unfermented state.

Dr Cameron, on the conclusion of his paper, was warmly applauded.

Dr Lyon Playfair, C.B., said that Professor Cameron's paper was one of great scientific as well as practical interest, inasmuch as ammonia and the nitrates were the only sources known, before Dr Cameron's experiments, from which plants could derive their nitrogen. He (Dr Playfair) hoped that Dr Cameron would continue his interesting and highly important investigations.

AGRICULTURAL SUMMARY FOR THE QUARTER.

In our last Summary we stated that, "generally speaking, the crops are somewhat later than usual at this period (June); but much depends upon the weather in July for bringing them to maturity." The weather during this month was of the most forcing kind —warm and sultry; under its influence the crops made very rapid progress after the soaking rains we had in June. In some districts there was not a drop of rain in July and beginning of August—as in the North of Scotland, where the pastures were quite burnt up, and the crops considerably shortened; in others again, as in Dumfriesshire and the counties in the south generally, the rain fell constantly, and sometimes in torrents, during that period. The general effect, however, of the warm weather, was to hasten the crops to maturity, so that harvest has been a fortnight earlier than most people anticipated from the state of the crops in July; and as generally happens

in such seasons, there was little difference in the ripening of the crops in the low and high districts. Harvest may be said to have been general throughout the country in the end of August; and though there were many fields of wheat thinned from last winter's frosts, and of oats from the slug and wireworm, which were still green, the rest of the crop was fully ripe for the sickle by that time.

It was at one time thought that there would be a scarcity of hands, and those who commenced harvest first did experience this inconvenience in some measure; still, upon the whole, after the Irish and Highlanders did make their appearance, there were found to be an abundance of reapers. Wages have, however, ruled high, as, seeing all the crop standing ready to be cut, and the anxiety of the farmers to proceed, the shearers held out till they obtained the wages they wanted, which for the first 4 weeks would average about 15s., with meat, per week. The crop being in a good state for the working of the reaping-machine, a good number were used, to the satisfaction of the owners. The light machines of easy draught appear to be coming more into favour than the more cumbersome ones of Bell.

As might be expected, there is great difference of opinion yet as to the crop; but the little that has been threshed has given rather an unfavourable impression both as to quality and to yield. Much of the wheat in the best districts was affected by the fly and mildew; and the want of sun in July, with the sultry heat which prevailed then, has affected the appearance of the pickle very much, giving it a dull greyish-yellow look, instead of that bright clear yellow appearance which grain always has which has ripened under a good sun. The yield of wheat in such districts, then, may be expected to be bad. The barley generally gives satisfaction. The oats, on the other hand, show the effects of premature ripening, being coarse in the husk. Such is the character of the samples that were first brought into the market. But the weather we had from the 1st to the 12th of September must make much of the grain, which was otherwise good, little better than that of last year's crop. During that period a great deal of rain fell, and considerable heat prevailed, so that in most of the fields where the grain was cut and exposed in stooks, the damage was very great from sprout. We are sorry to say that on most of the farms in the low and middle districts of the country, the greater part of the crop was exposed in this state.

On the 14th September a high wind sprang up, and continued for a day or two, so that much of the exposed corn was got into the stack-yard, and what was uncut was considerably shed. The potato disease, we regret to say, has made great progress throughout the whole country. The weather we had in the beginning of September tended much to hasten it; and fields in which the potatoes were being lifted, and not a diseased tuber was found on the 12th September, on the 14th they were numerous.

Reaping and Mowing-Machines.—We are glad to find reports

of several trials of machines of this description, both in this country and in America. It shows that farmers and agricultural societies are now fully alive to the important part they will ere long play in agriculture, and to the growing necessity there is found for them. This year an immense breadth of crop came so rapidly to maturity in East Lothian, that at first it was found impossible to find hands to cut it down. Had a high wind risen at that time, the loss which would have accrued to the farmers would have been very great; but they were in such a position that they could not help themselves. Had efficient reaping-machines been possessed by them, they might have been at work from sunrise to sunset with a limited number of people, and thus the crop would speedily have been put beyond the risk of shaking. The trial of reaping-machines under the sanction of the Royal Agricultural Society of England took place at Salisbury, when the first prize was awarded to Burgess and Key's machine, the second to Croskill's Bell's, and the third to Lord Kinnaird's, thus reversing the decision of the Judges last year, who placed Croskill's first, Burgess and Key's second, and Dray's Hussey's third. The peculiarity of Burgess and Key's is the possession of a spiral screw, by which all the grain it touches is brought onwards, and thus conducted to the platform. Only one person is required to work it. As regards Dray's machines, the Judges of this year state that they consider them only reaping-machines; and "while the present system, so largely practised by farmers, of growing seeds with their barley crops continues on those farms, Messrs Dray's machines are not of general utility."

Another trial took place in the Carse of Gowrie, when the first prize was awarded to Burgess and Key's screw-machine as above, the second to Lord Kinnaird's, and the third to Dray's Hussey. Thus, in both England and Scotland, Burgess and Key's machine is the champion for this year. But it is somewhat remarkable that the Judges in the two countries should have differed so much in opinion about Dray's Hussey's. In England they condemn it as not being well adapted for cutting barley among which seeds have been sown, but praise it for the cutting of wheat alone; while in Scotland it was declared to do better work in the barley than any other machine, though two of the others were considered superior when the work was performed among wheat.

Agricultural Societies.— The national agricultural societies of England, Scotland, and Ireland, have held their great annual shows during the last quarter, which may be regarded as the principal agricultural events of that period. As full reports of the proceedings have been published in all the papers of the day, we will not allude to them farther at present, but will merely touch upon one or two of the most prominent features. It has now become the custom to read a paper or have a discussion on some important [illegible] the shows of both the Royal Agricultural

Society of England and the Highland and Agricultural Society of Scotland. At the former, a most interesting paper was read by Mr Squarey of Odstock on the "Water Meadows," in which he proved the profit arising from the operation in Wiltshire. At the latter, Professor Anderson delivered a lecture on the "Methods by which the farmer can best protect himself from the adulteration of manures." The lecture contained the sensible practical remarks which usually fall from the learned Professor in his addresses to practical men. We strongly recommend a perusal of it to our agricultural friends. At one of the sederunts of the Royal Agricultural Society of England some dissatisfaction was expressed at the exclusion of tenant-farmers from the Council, and of the want of publicity of the proceedings of the Society generally. It would be well if those who take an active part in the management of the Society would take warning in time, and submit to the infusion of some new blood into its management. The English Society is by no means so aristocratic in its constitution as the Highland Society. The former has already more than once paid the compliment to agriculture by electing for its presidents country squires, whose chief recommendation was their zeal for the progress of agriculture, and the distinguished place they held in the country as practical farmers. The Highland Society, on the other hand, rejoices only in ducal presidents and titled vice-presidents. If the English Society takes care to follow out the principle in the election of the other office-bearers which it practises in the election of its presidents, and also to render its meetings more attractive to its members generally, there can be no doubt that it will take such a hold of the affections of the agricultural body as to increase immensely its influence and usefulness. The Highland Society, notwithstanding the exclusiveness shown in the election of the principal office-bearers, possesses the confidence of the farmers of Scotland to a much greater degree than the English Society does that of the farmers of England; and this, we think, arises very much from the Scotch farmers being represented in the directorship, and, besides, consulted as a body generally in the making up of the premium list, and other points in the management in which they are directly interested.

British Association.—Farmers must ever feel grateful to the members of the British Association for what they have done for agriculture. It was from it that Liebig's first important work, *Organic Chemistry in its Applications to Agriculture and Physiology,* emanated. Every year, questions more or less connected with agriculture have been discussed at its meetings. Last year we had the summing-up of the controversy between Liebig and Lawes ably laid before the public by Dr Daubeny, its President; and this year the paper read by Dr Cameron on "Urea as a direct Source of Nitrogen in Vegetation," has drawn public attention to a subject important in its economic and sanitary results both to the

consumer (or inhabitants of towns) and the producer, the farmer. As the details of the experiments performed by Dr Cameron, and reported on in his essay, are given in another part of the Journal, we simply refer to them here.

Law Decisions—Restrictive Clauses in Leases.—A case has lately been decided in Kincardineshire, which ought to act as a warning to both landlords and tenants in the construction of their leases. A tenant holding land under Dr Milne's trustees was bound by a clause of his lease to "comply with the rules of good husbandry established in that part of the country." There was no specific rotation mentioned in the lease. The rules of good husbandry established in the district appear to have been the five or six course shift. The tenant adopted, however, the four-course shift on two of his fields, so as to bring them "into a system, along with the other parts of the farm, so as to have it in his power to leave the whole farm in one uniform rotation at the termination of the tack." The trustees brought an action against him for miscropping, or for an infraction of that clause of his lease by which he was bound to follow the rules of good husbandry established in the district. It was urged by the pursuers, that the tenant having obtained good crops from the adoption of the four-shift course—which was not in use in Kincardineshire—and thus reaped an extra benefit from such good crops, that extra benefit must be returned to the landlord. The Sheriff before whom the case was brought decerned in favour of the tenant, with costs. We have not for some time read of a more trivial case, and one founded on more unjust grounds, brought before a court of justice. In the first place, the lease was most vaguely framed; and in the next place, the trustees have been very ill-advised in raising an action against their tenant, or advancing a claim which the Sheriff wisely pronounced to be "palpably unjust," and designated "the data of the pursuer's witnesses to be strange doctrine." Strange, indeed! if a tenant is to be pulled up for adopting a more profitable system of farming than that indicated in a loosely-worded lease, even though he may be proved not to have adhered to the strict letter of the law, provided that in adopting that system he has done nothing contrary to the interests of his landlord. We can only hope, for the sake of the trustees, that the report of the case we have read has been incomplete, and that there are more solid grounds for raising an action than what is stated in the said report.

Exposing Diseased Animals for Sale.—An English farmer has lately been fined £24, 11s. for exposing for sale a number of sheep suffering under the disease called the "Scab," in the public market at Lincoln. The magistrates decided that it was a "very gross case, and ordered the sheep to be destroyed." This power of the magistrates is one that must be exercised with much discretion, farmers as well as the public are interested in it. For

nothing is so contagious as cutaneous diseases, such as scab; and one lot of sheep suffering severely from it is apt to affect the stock of a whole neighbourhood, if proper attention be not paid to it. But at the same time, stock of all kinds may be sent to a public market which may be suffering under disease unknown to the owners; or, in fact, may have disease upon them in such a trivial form as not to affect the meat, and not be liable to do much damage to other stock brought in contact with them. It would be hard, therefore, both to fine the owners of such stock, and to destroy the stock. We repeat, then, that such power possessed by the magistrates must be exercised with great discretion.

Accommodation for Shearers.—A case has lately been decided by Sheriff Craigie, at Jedburgh, which has excited considerable interest and astonishment in the agricultural world. Two men, Turner and Campbell, were engaged by Mr Robson, the tenant of Kimmerghame Mains, to work as bandsters for the harvest, at the rate of 20s. per week, promising the best of usage. "On going to their work according to their agreement, they were shown into an empty room to sleep, were given each a pair of blankets, and told to take straw for their bed." They, however, requested to be provided with a chaff bed, with a bolster and sheet, or a blanket in place of a sheet; but which being refused them, they declined entering on their work, and left the place. They were apprehended and brought before the Sheriff, when proof was led as to the accommodation usually provided for shearers in Berwickshire—viz. such as was offered Campbell and Turner. The Sheriff decided in favour of the men. Farmers who require to engage yearly from 50 to 100 shearers or more, may look upon this decision with alarm, for they will naturally ask themselves how they are to provide these temporary but valuable assistants with a chaff bed, bolster, and sheet. We do not think, however, that there is much cause for alarm, as we are sure that the case would be reversed if carried to a higher court. It is also satisfactory to farmers to know that chaff beds and bolsters are not likely to be called much into requisition by the shearers, for most of them will be more likely to prefer clean straw to a bed or bolster, the previous occupants of which may have been quite unknown to them, and rather suspicious in their habits.

Agricultural Statistics.—Mr Caird has introduced a bill for the collection of Agricultural Statistics in England. The management of the collection is to be intrusted to the Registrar-General, who, with the approbation of the Commissioners of Her Majesty's Treasury, may appoint one or more Inspectors to act under him, whose duty it will be "to make direct visits from time to time, and shall be empowered to test the accuracy of returns, and to make such further investigations, and perform such other duties in strict connection with the object of this act, as the Registrar-General or the Board of

Trade may deem necessary or expedient, and such Inspectors shall be removable by the Registrar-General." The names of the occupants of land are to be returned every year to the Registrar-General by the overseers of the poor of every parish. The schedules, which are to be delivered to the farmers by properly appointed persons, are to be filled up by the farmers or any persons deputed by them to do so, with the acreage under the different kinds of crops on the 1st of June. They shall then be returned to the Registrar-General, who must publish them by the 1st of August. If any farmer fail to make a return according to the Act, the persons having charge of the collection are empowered to get the particulars required by other means, and are authorised to enter upon and inspect the lands of such farmer at any time or times during the day, for the purpose of ascertaining such particulars, and shall not be liable to action of trespass, or any other action or proceeding, for so doing.

We do not think that Mr Caird can be very sanguine as to the passing of his bill. In its present form, it appears to be thrown out more as a feeler than anything else. Indeed the friends of agricultural statistics could not give a hearty support to the bill in its present incomplete form. There is to be no return of the number of stock kept, and none of the estimate of produce; and therefore it will fail in one of the principal objects of the collection of agricultural statistics—viz. the estimating of the available produce for food in the country. For it must be borne in mind that the produce per acre has as great an effect in determining the gross produce of the whole crop as the acreage has, and the annual variation of the former is often much greater than that of the latter. We expect that there will be three classes of opposers to the bill in Parliament: 1. Those who disapprove of the collection of agricultural statistics altogether; 2. Those who approve of it, but who will naturally object to Mr Caird's bill as providing only for the obtaining of a morsel of what they want; and, 3. The economist, who will reasonably object to the expense of the means proposed for obtaining the ends contemplated. For there is no doubt that a prominent feature of the bill is the creation of new offices, and the formation of a machinery for working out its provisions, which must be attended with considerable expense to the country.

Farmers' Clubs.—There have not been many meetings held for agricultural subjects during the last quarter. Farmers generally spend their spare time during the summer in visiting other districts; and harvest coming on during the quarter, prevents those intellectual social meetings taking place at which so many useful agricultural questions are discussed. Some of the clubs have begun to award premiums for different purposes not usually included in the premium list of the ordinary agricultural societies,—such as for the best mowers of corn, for the best takers up of the corn when mown, for [illegible]ders and stookers, &c. We draw attention to these pre-

niums, awarded by the Hexham Farmers' Club, as worthy of imitation by other societies and clubs; for if there is retrogression in one operation more than another in agriculture, it is in the cutting, binding, and stooking of grain, the stubbles being left in a far more slovenly state than formerly. Other clubs have had their cattle-shows, many of which have been held during the last quarter. It would be well if the directors of these clubs would endeavour to hold their shows on such days as that there would be as little interference with the arrangements of one another as possible. The holding of the exhibitions of stock of the Highland Society and the Yorkshire Society at the same time this year, was a positive public evil, and was at the same time injurious to these societies themselves; for much of the stock exhibited at one of the shows would have been exhibited at both if they had been held in different weeks, and many people, instead of being compelled to visit one or other of the show-yards, would certainly have given their presence to both.

Road Reform.—This has again formed the subject of an important discussion in the East of Berwickshire Farmers' Club, and also at the Haddington County Meeting. From what passed at both meetings, we think that the question is scarcely ripe for legislation. It is at that stage of its progress when such discussions as those that took place at these two meetings are of great importance. The advocates of the different measures proposed, or rather the different substitutes for toll-collection, employ themselves, we think, profitably in the mean time in finding out the weak points of the toll-system, and of the schemes proposed by their neighbours. It is to be hoped that, through time, after the exposure of the evils of the various plans, and the proposal of remedies for them, some measure will be framed on which most parties will agree.

Portable Manures as a Top-Dressing.—This question has been lately discussed at the Galashiels Farmers' Club. The resolution at which the club arrived, by a large majority, was: "That it is the opinion of this club that, with the exception of poor soils—soils deficient in organic matter, and soils newly reclaimed—it is not profitable to apply portable manures to cereal crops." Now, this resolution, which was no doubt intended to express the opinion of the members of the club as disapproving of the general application of portable manures to the cereals, really recommends it. For unfortunately, both in the Galashiels district, and in Scotland generally, the classes of soils mentioned in the resolution—viz. "poor soils, and soils deficient in organic matter"—as exceptions on which it is profitable to apply portable manures, comprehend the greater part of the surface. We say, without fear of refutation, that according to that resolution it would be profitable to apply portable manures to the cereals grown on between seventy and eighty per cent of the soils of Scotland. We do not deny that, in a year

like last, in many cases the application was unprofitable; b year was quite exceptional. This season, many high farmer had previously been in the habit of using portable manures to the cereals, and who, having suffered last year, did not us so extensively this, have now regretted this step since the have been cut. It is strange, but not less the fact, that who are the most extensive users of portable manures for the are the high farmers whose land is in the highest state of fe and which consequently would require such an application less being convinced of the advantage of the practice, and anxious, same time, to take the largest possible produce from the soi still persist in applying portable manures to the cereals. Th two important omissions in the resolution—viz. the consid of the climate, and of the nature of the soil, whether clay, or or gravelly; for these manures may be used on a soil in a dry c with profit, which might be converted into a loss were tl situated in a moist climate. They may also be used on a cl with profit, but on a light soil of the same degree of fertilit in the same climate, with considerable loss.

Pleuro-pneumonia—Steppe Murrain, &c.—We regret to s in no season, for some years back, has the pleuro-pneumoni so bad among the cattle, both of this country and Ireland, as present. Whole herds have been decimated; and the diseas ing made its appearance in a particular district, has contin ravages for months. The more we see of this complaint, th are we inclined to consider it epidemic. Herds, in which been most fatal in one place, have been removed to another d when it has been known to disappear, though the whole cattl treated the same as formerly. We are happy to say that the felt about the Steppe murrain have now in a great measu sided since the report brought home by Professor Simonds. G ment, however, thought it proper to prohibit the importa bones from those districts in which the murrain was most vi The prohibition extended even to cargoes afloat; but we a to say that this part of it has been relaxed through the repr tion of the Highland and Agricultural Society of Scotland.

ᴀGE PRICE OF THE DIFFERENT KINDS OF GRAIN,

PER IMPERIAL QUARTER, SOLD AT THE FOLLOWING PLACES.

LONDON.

.	Barley.	Oats.	Rye.	Pease.	Beans.
.	s. d.	s. d.	s. d.	s. d.	s. d.
5	42 1	29 3	36 10	34 4	39 1
9	42 11	26 6	33 4	44 2	41 11
3	37 10	25 4	34 0	43 9	41 10
1	43 0	30 1	35 8	43 6	40 10
2	41 4	30 1	37 6	43 4	43 2
7	38 10	29 10	38 10	36 0	42 3
5	39 2	28 6	41 7	42 8	45 1
0	40 5	26 3	41 4	40 0	41 10
4	36 0	32 9	40 6	44 5	41 5
2	40 2	31 2	39 4	42 7	43 0
0	34 0	28 1	38 6	40 5	41 11
0	42 8	28 8	39 2	41 7	44 0
3	45 3	29 6	40 0	42 0	42 8

EDINBURGH.

Date.	Wheat.	Barley.	Oats.	Pease.	Beans.
1857.	s. d.	s. d.	s. d.	s. d.	s. d.
June 3.	48 9	37 7	32 0	44 0	44 8
10.	47 2	39 5	31 1	43 6	44 2
17.	46 11	37 5	31 4	42 0	42 8
24.	46 8	35 11	30 10	42 6	43 5
July 1.	46 7	36 0	30 5	42 0	42 5
8.	48 8	33 9	30 10	44 2	45 0
15.	46 6	34 11	30 9	43 6	45 0
22.	42 4	35 6	32 4	44 6	45 8
29.	43 6	36 1	32 1	45 6	50 0
Aug. 5.	47 8	35 4	32 3	45 8	47 3
12.	46 1	33 6	32 5	47 6	48 8
19	43 7	33 3	31 10	46 9	47 7
26.	41 7	35 3	31 8	46 4	47 3

LIVERPOOL.

t.	Barley.	Oats.	Rye.	Pease.	Beans.
L.	s. d.	s. d.	s. d.	s. d.	s. d.
3	31 11	26 7	34 6	40 6	46 6
0	32 2	25 5	33 6	42 4	45 4
0	32 9	27 4	32 3	43 11	46 10
5	39 9	25 11	33 10	44 2	45 2
1	38 6	26 1	34 5	43 4	44 5
0	35 3	27 0	35 3	42 2	45 8
5	33 8	26 3	36 9	43 6	50 0
7	35 9	26 1	37 4	44 2	44 9
0	35 6	26 8	38 6	43 4	46 6
8	35 9	26 5	39 4	42 6	50 2
8	36 8	23 1	38 10	41 10	46 4
7	38 3	25 1	38 4	40 8	46 6
9	39 2	30 8	38 6	41 4	45 4

DUBLIN.

Date.	Wheat, p. barl. 20 st.	Barley, p. barl. 16 st.	Bere, p. barl. 17 st.	Oats, p. barl. 14 st.	Flour, p. barl. 9 st.
1857.	s. d.	s. d.	s. d.	s. d.	s. d.
June 5.	37 6	23 6	15 10	16 9	22 6
12.	37 0	23 1	15 6	16 8	22 7
19.	37 6	24 2	15 8	17 2	22 8
26.	36 9	26 6	16 8	16 7	22 5
July 3.	37 4	23 6	16 6	17 1	22 6
10.	36 9	22 8	16 4	16 7	22 3
17.	37 0	22 10	16 2	16 9	22 5
24.	36 0	20 6	16 0	16 6	22 2
31.	35 0	19 8	16 3	17 0	22 1
Aug. 7.	34 6	20 6	16 9	16 10	22 0
14.	34 0	21 6	17 2	16 6	21 10
21.	32 0	20 6	17 6	15 10	21 3
28.	32 7	21 0	17 0	15 6	21 4

E SHOWING THE WEEKLY AVERAGE PRICE OF GRAIN,

terms of 7th and 8th Geo. IV., c. 58, and 9th and 10th Vict., c. 22. On and after 1st 1849, the Duty payable on FOREIGN CORN imported is 1s. per quarter, and on Flour 4½d. for every cwt.

	Wheat.		Barley.		Oats.		Rye.		Pease.		Beans.	
	Weekly Average.	Aggregate Average.	Weekly Average.	Aggregate Average.	Weekly Average.	Aggregate Average.	Weekly Average.	Aggregate Average.	Weekly Average.	Aggregate Average.	Weekly Average.	Aggregate Average.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
..	58 9	58 11	41 8	42 9	26 2	24 7	40 10	39 9	40 5	40 9	44 3	42 9
..	60 0	57 11	38 9	42 0	26 5	25 2	36 0	40 0	42 11	41 4	44 3	43 5
..	60 1	58 7	38 11	41 3	26 7	25 8	40 6	39 11	42 8	41 10	44 10	44 0
..	61 6	59 3	37 7	40 3	27 9	26 2	43 4	40 2	43 11	42 4	45 2	44 6
..	63 5	60 3	39 0	39 8	27 3	26 7	41 11	40 7	44 5	42 9	45 11	44 10
..	63 10	61 3	37 8	38 11	27 2	26 11	40 6	40 6	43 11	43 0	45 4	44 11
..	63 8	62 1	37 9	38 3	27 9	27 2	42 7	40 10	44 4	43 8	45 11	45 3
..	62 7	62 6	38 3	38 2	27 8	27 4	41 3	41 8	42 8	43 8	45 6	45 5
..	59 8	62 5	38 5	38 1	28 7	27 8	39 5	41 6	41 1	43 5	46 5	45 8
..	58 1	62 0	39 1	38 4	28 2	27 9	38 10	40 9	40 10	42 11	46 11	46 0
..	59 2	61 3	40 0	38 6	27 8	27 10	40 5	40 6	40 10	42 3	47 1	46 2
..	59 10	60 7	39 10	38 11	27 11	28 0	39 11	40 5	41 5	41 10	47 5	46 6
..	59 9	60 10	40 0	39 1	28 0	28 2	39 8	40 1	40 6	41 4	46 4	45 2

FOREIGN MARKETS.—PER IMPERIAL QUARTER, FREE ON BOARD.

Date.	Markets.	Wheat.	Barley.	Oats.	Rye.	Pease.	Beans.
1857.		s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.
June ..	Danzig	56 6 - 62 0	28 6 - 36 6	16 6 - 23 0	30 0 - 33 6	33 0 - 40 0	31 6 - 39 [illegible]
July ..	Danzig	58 6 - 64 6	29 6 - 38 0	17 6 - 25 0	31 6 - 36 6	34 0 - 42 0	33 6 - 41 [illegible]
August	Danzig	54 6 - 60 0	30 6 - 40 0	17 0 - 24 6	32 6 - 36 0	34 6 - 43 6	34 0 - 42 [illegible]
June ..	Hamburg	57 6 - 64 0	27 6 - 36 0	17 6 - 25 0	30 6 - 36 6	32 6 - 39 0	35 6 - 43 [illegible]
July ..	Hamburg	58 6 - 65 0	28 6 - 38 0	17 6 - 24 6	32 0 - 38 6	34 6 - 41 6	36 0 - 44 [illegible]
August	Hamburg	48 6 - 55 0	28 6 - 39 6	17 0 - 24 0	31 6 - 37 6	35 6 - 42 6	37 6 - 46 [illegible]
June ..	Bremen	46 6 - 53 6	27 6 - 35 0	16 6 - 24 0	31 6 - 36 6	33 9 - 41 3	34 6 - 40 [illegible]
July ..	Bremen	48 0 - 55 0	29 0 - 39 6	17 6 - 25 0	33 6 - 39 6	35 6 - 43 0	32 6 - 40 [illegible]
August	Bremen	50 6 - 61 6	28 6 - 37 0	18 0 - 25 0	34 0 - 40 0	35 6 - 44 0	32 0 - 41 [illegible]
June ..	Königsberg	58 6 - 65 0	29 6 - 39 0	18 0 - 25 0	33 6 - 38 0	32 6 - 42 0	33 6 - 43 [illegible]
July ..	Königsberg	56 6 - 63 6	27 6 - 34 6	18 6 - 26 0	34 6 - 40 0	33 6 - 44 0	32 6 - 42 [illegible]
August	Königsberg	57 6 - 62 0	28 6 - 36 6	17 6 - 24 0	32 6 - 37 6	34 6 - 45 0	34 0 - 44 [illegible]

Freights from the Baltic, from 3s. 3d. to 4s.; from the Mediterranean, 6s. to 6s. 6d.; and by steamer from Hamburg, 3s. 6d. to 4s. 6d. per imperial qr.

THE REVENUE.—FROM 31ST MARCH TO 30TH JUNE 1857.

	Quarters ending June 30		Increase.	Decrease.	Years ending June 30.		Increase.	Decrease.
	1856.	1857.			1856.	1857.		
	£	£	£	£	£	£	£	£
Customs	5,864,724	6,145,349	280,625	..	23,130,444	23,602,468	472,024	..
Excise	5,005,000	4,504,000	..	501,000	17,552,778	17,664,000	111,222	..
Stamps	1,858,083	1,850,491	..	7,592	7,062,115	7,364,617	302,502	..
Taxes	1,343,026	1,324,000	..	19,026	3,097,026	3,097,020	..	6
Post-Office ..	716,000	675,000	..	41,000	2,768,152	2,845,000	76,848	..
Miscellaneous	384,419	320,382	..	64,037	1,435,311	1,318,993	..	116,318
Property Tax	2,376,751	2,455,540	78,789	..	15,187,953	16,168,723	980,770	..
Total Income	17,548,003	17,274,762	359,414	632,655			1,943,366	116,324
	Deduct increase....			359,414	Deduct decrease....		116,324	
	Decrease on the qr.			273,241	Increase on the year		1,827,042	

PRICES OF BUTCHER-MEAT.—PER STONE OF 14 POUNDS.

Date.	LONDON.		LIVERPOOL.		NEWCASTLE.		EDINBURGH.		GLASGOW.	
	Beef.	Mutton.	Beef.	Mutton.	Beef.	Mutton.	Beef.	Mutton.	Beef.	Mutton.
1857.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.
June ..	6 6 - 8 6	6 6 - 8 9	6 6 - 8 6	6 6 - 8 9	7 6 - 9 3	6 9 - 8 9	6 6 - 8 6	6 9 - 8 9	7 3 - 8 9	7 6 - 8 9
July ..	5 9 - 7 9	6 6 - 8 6	5 6 - 7 6	6 3 - 8 3	7 0 - 9 0	6 6 - 8 3	6 3 - 8 3	6 6 - 8 6	7 0 - 8 6	7 3 - 8 6
Aug. ..	6 0 - 8 6	7 6 - 9 0	6 0 - 8 3	6 0 - 8 0	7 6 - 9 0	6 9 - 8 9	6 6 - 8 6	7 0 - 8 9	7 6 - 8 9	7 6 - 9 0

PRICES OF ENGLISH AND SCOTCH WOOL.—PER STONE OF 14 POUNDS.

ENGLISH.	s. d. s. d.	SCOTCH.	s. d. s. d.
Merino,	22 6 to 30 0	Leicester Hogg,	22 0 to 26 6
.. in grease,	18 0 ,, 23 6	.. Ewe and Hogg,	18 0 ,, 24 0
South-Down,	22 0 ,, 27 0	Cheviot, white,	17 0 ,, 22 6
Half-Bred,	17 0 ,, 22 6	.. laid, washed,	11 6 ,, 16 0
Leicester Hogg,	20 0 ,, 26 6	.. .. unwashed,	9 3 ,, 13 9
.. Ewe and Hogg,	18 6 ,, 24 6	Moor, white,	9 0 ,, 13 6
Locks,	10 6 ,, 13 6	.. laid, washed,	7 3 ,, 9 9
Moor,	8 0 ,, 10 0	.. .. unwashed,	6 0 ,, 7 9

ROMAN HUSBANDRY.

It is scarcely perhaps to be expected that the examination of the agricultural writers of ancient times will reward us with information calculated materially to influence our practice in the present day. Still less can we hope to derive from them anything valuable in a theoretical point of view, tending to explain the *rationale*, or elucidate the principles on which the operations of husbandry depend. As with ourselves up to a recent period, they derived no aid from the physical sciences; these were not then, indeed, in a condition to afford any considerable means of improvement to the ordinary arts of life. Ancient agriculture, therefore, was carried on entirely in an empirical manner, and was founded solely on the results of observation and experience. We are furnished with instructions what to do—no explanation is in general attempted of the reasons for doing it. And although these instructions are often dictated by sound observation and strong practical good sense, and are found to coincide with usages which science has now taught us to be the best that can be followed, yet they are not unfrequently mingled with notions the most crude and extravagant. Natural phenomena, in their relation to rural affairs, were so little understood that they gave occasion to endless superstitious and absurd observances; hence the agricultural knowledge of the ancients often presents a striking contrast to their eminence in philosophy, literature, and certain of the fine arts.

Such, in particular, was the case with the husbandry of the Romans. In many departments it seems to have reached a considerable degree of perfection, while in others we cannot help being surprised at its glaring defects. Founded as it was on the accumulated experience of Greece, Egypt, and the nations of the East, it may be regarded as an epitome of the agricultural knowledge of the ancient world, embodying whatever had been found most effective in different countries, at least as far as applicable to the Roman Empire, which was of such extent as to embrace a vast variety of climates, soils, and produce. To the knowledge thus obtained, important additions could not fail to be made, when the energies of this most ingenious and enterprising people were directed to the subject. And it is well known with what zeal this was done. Agriculture can nowhere be neglected without the punishment for this neglect becoming speedily felt; but even amidst their endless wars and intestine commotions, the Romans never neglected it. At one period almost every citizen was an agriculturist; at all times there were many with whom husbandry became a passion. Commerce, trades, the other arts, were regarded as subordinate to it. The most illustrious citizens engaged in it; the most renowned generals retired from their conquests to seek in it a

happier life. Ceres stood enthroned in the capitol, the emblem of one of the great national interests. Prominent among the institutions of Rome was a college, with its due complement of priests (*Arvales Fratres* or *Arvorum Sacerdotes*), whose sole office was to offer suovetaurilian sacrifices, and propitiate the gods in favour of agriculture. The most distinguished families—the Pisones, Fabii, Lentuli, &c.—thought themselves honoured by connecting their names with it. In cultivated minds it became associated with the beauties of nature, the love of retirement, and the charms of a rural life. Hence its influence upon Roman literature. It afforded a theme for the eloquence of their orators and philosophers; while to their poetry it became the breath of an inspiration, and was married, by the greatest of their poets, to immortal verse.

Under such favourable influences we might perhaps have been warranted to expect that Roman husbandry would have arrived at greater perfection, and bequeathed to us a greater amount of available knowledge than it has actually done. It is possible, however, that the portion of their literature relating to it which has reached our times, may not fairly and fully represent its real condition. It has always been the case with agriculture—at least till a very recent date—that those who were most engaged in it, and most familiar with its practical operations, were least qualified, and least inclined, to describe its processes for the behoof of others. Its exposition and history have often, therefore, fallen to the lot of those who possessed greater facility of authorship than intimacy with the subject—who were better qualified to hold the pen than the plough—amateurs and others who felt the attraction of its picturesque and agreeable accessories, but who had never mastered its laborious details. If Roman husbandry suffer somewhat in our eyes from this or some similar cause, there still remains enough in what has been transmitted to us to excite deep interest and invite careful examination. It is interesting to observe what was accomplished in this, the most important of the arts of life, by a people who achieved such great things in so many other fields of exertion, and to institute a comparison between their practices and those of the present day. Such an inquiry is calculated to throw light on the manners, sentiments, and social condition of a people who have exercised such a powerful influence on the destinies of mankind. It presents many attractions to the classical scholar, by affording the means of elucidating passages in some of their most interesting writings, which, without such knowledge, would remain unintelligible or obscure. And if no one regards as misspent the time and energy which have been employed in attempts to rediscover traces of arts which have disappeared—in sifting, as it were, the very dust of the ancients, that no particle of their knowledge may be lost; if ingenuity has been exhausted on verbal criticism in order to determine the precise meaning of the most trifling passages in their writings, we must surely still more approve of any effort to

make us acquainted with the methods they adopted in order to avail themselves to the utmost of the bounty of nature, and provide not only for the most urgent wants, but also for the comfort and enjoyments of the community. The history of agriculture would indeed be incomplete without a correct knowledge of its condition among the most powerful and civilised people of the ancient world.

The subject, accordingly, has been taken up by various authors, viewed in different lights, and treated in a manner more or less satisfactory. Towards the close of last century it was handled at great length, and in a very able manner, by a Scotch clergyman, Mr Dickson;* but his work, though learned, elaborate, and valuable, was heavy and unattractive, and never obtained general perusal. More recently it has been discussed, with learning and skill, by Mr Chandos Wren Hoskyns, and his little work must be regarded as a pleasing contribution to the history of agriculture. A volume on the same subject has just appeared, bearing the well-known and respected name of Dr Daubeny of Oxford.† He gives us an analysis of the principal works of the Romans, relating to agriculture, which have come down to us; endeavours from these to form an estimate of their actual operations and practice; contrasts their knowledge with our own; and, while he points out their defects, draws attention to such hints as they suggest for our own improvement. Various collateral topics are touched upon; and, in particular, an attempt is made, chiefly from the materials which Professor Sibthorp provided for the purpose by a personal examination of the countries, to identify the plants described or alluded to by Greek authors, especially by Dioscorides. This portion of the work will be highly valued by the learned; and it is much to be desired that a similar attempt were made in regard to the plants mentioned by the Roman writers; for it is not a little to our discredit that we are still unable, in many instances, to say with certainty what trees and plants they designated by particular names.

Taking Dr Daubeny's beautiful volume for our guide, it has occurred to us that it would be both interesting and profitable to our readers to draw their attention to some of the topics of which he treats, and make them acquainted with some of the results of his investigations. To this we are the more inclined, from the consideration that the somewhat costly style of the work, and its hav-

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* *The Husbandry of the Ancients*, by ADAM DICKSON, A.M., late Minister of Whittingham. 2 vols. Edinburgh, 1788.

† *Lectures on Roman Husbandry*, delivered before the University of Oxford, comprehending such an account of the system of agriculture, the treatment of domestic animals, the horticulture, &c., pursued in ancient times, as may be collected from the *Scriptores Rei Rustici*, the *Georgics of Virgil*, and other classical authorities; with notices of the plants mentioned by Columella and Virgil. By CHARLES DAUBENY, M.D., F.R.S., Professor of Botany and Rural Economy in the University of Oxford. Oxford, 1857.

ing the appearance of being mainly a commentary on the Greek and Roman classics, may prevent its coming under the notice of many practical farmers, although so well worthy of occupying a place in an agricultural library.

The works that have come down to us, embodying the agricultural knowledge of the ancient Romans, are by no means numerous. They consist chiefly of the five treatises comprehended under the title of *Rei Rustici Scriptores* (writers on rural affairs); and of more than one of these it may be said that they are desultory and miscellaneous, without method, and of a very fragmentary character. No doubt many treatises on the subject have been lost—perhaps the best of them; for Columella says of Tremellius Scrofa, whose works are now unknown, that he had rendered agriculture eloquent; while Varro describes him as the most skilful of the Romans in the practice of agriculture. These considerations seem to add further force to the remark formerly made, that the materials in our possession may fail to make us fully acquainted with the extent of their knowledge on this subject. Columella is the author by far the fullest and most complete, and he may be regarded as presenting us with an entire system of husbandry as followed in his day. His treatise consisted originally of twelve books; but what was once regarded as a separate work—his treatise on trees—is frequently incorporated with it; so that the whole consists of thirteen books, one of which is in verse. We know little of Columella's personal history, beyond what may be gleaned from his own works, and the casual mention made of him by the elder Pliny. But he flourished about the year A.D. 42; so that he was cotemporary with Seneca and Celsus, both of whom he names. He presents the subject to us, therefore, as it was after it had emerged from its early struggles and difficulties—had benefited by the results of matured experience—and enjoyed the advantage of a period of advanced civilisation and more continuous attention to the arts of peace. It is for this reason that Dr Daubeny confines his attention chiefly to this author, referring to the others only when they happen to give additional information, or throw any incidental light on his statements.

It is scarcely possible to mention the ancient prose-writers on husbandry without alluding to such as write in verse; and to Virgil in particular, as incomparably the most eminent. In a practical and matter-of-fact age like the present, we cannot help regarding a didactic poem, such as his *Georgics*—one designed to instruct in the common details of field-cultivation and cattle-rearing—as a thing the most preposterous and unfit. The case was somewhat different in former times, when books were scarce, and verse afforded facilities for recollection and committing to memory. It must be readily conceded, also, that the subject presents itself in various aspects highly fitted for poetical treatment;

uch as the vicissitudes of the seasons, the phenomena of the weather, the hopes and fears of the husbandman, &c. But there are many others, which must be fully treated of in a work which aspires to be useful, that have no connection with the domain of poetry, and which it is a breach of all the proprieties to force within its pale. The incongruity is less felt in Virgil than perhaps in any other instance; for even in the meanest and most homely parts of his subject, we are sustained and carried along by the easy and melodious (though somewhat monotonous) flow of his versification, the singular felicity of his epithets, and the constructive skill of the whole piece. But that he has been cramped and depressed, we at once feel when we follow him into one of the numerous episodes with which, as if conscious that it needed relief, he has interspersed his poem, when he again enters the true atmosphere of poetry, and gives proof that he feels its inspiration. Delille says, with something of exaggeration, that few read Virgil's *Georgics,* while every one acquainted with the Latin language knows the fourth book of the *Æneid* by heart. This author himself is a proof, in his poem *Les Jardins*, of the injudiciousness of employing poetry as a medium of practical instruction; it must have been much read, but it is difficult to see how any one could read it with pleasure. In fact, whenever poems of this kind become practically useful, they degenerate into prose, in whatsoever form the words may be arranged; and whenever they rise into true poetry, the likelihood is, that it is in treating of something that has little or no connection with the subject. But it is not probable that such a method will be again adopted as a channel for conveying the practical facts of science or the arts to the world. For the rest, Virgil's acquaintance with husbandry, as practised in his day, seems upon the whole to be pretty full and correct; and he has clothed many of its leading truths in expressions so terse and appropriate, that his poem must have tended greatly to give them currency and perpetuity.

The *Res Rustica* of the Romans was a much more comprehensive term than the modern words agriculture or husbandry, and it may be said to have embraced even a wider field than we commonly understand by rural economy. It comprehended not only tillage, but also the culture of the vineyard and orchard—the treatment of domestic animals—what we now call horticulture, or the cultivation of a garden—the construction and care of fish-ponds—cochlearea, or receptacles for snails and shell-fish—wine-making—and many other collateral subjects. The treatment of bees, now a matter of such small account that we do not recognise it among the objects of the farmer's attention, may be thought to occupy a disproportionate importance in ancient records of husbandry; but a moment's reflection shows the reason of this. Before the art of extracting sugar from plants was known, honey was the only sub-

stance that could supply its place, and it thus came to be ranked among the necessaries of life.

The grand operations of husbandry must in their nature be at all times, and in every place, pretty nearly the same. Keeping these in mind, we shall proceed to mention what was the knowledge and practice of the Romans in the principal departments—comparing their state of progress with our own, and chiefly from the materials with which Dr Daubeny's work supplies us, although drawing at times from other sources.

The preparation of the soil for the reception of the seed is an operation of primary importance in husbandry. The soils themselves were classified according to their most obvious physical properties, or as one particular ingredient happened to predominate, the terms being generally such as explain themselves. Thus we have fat and lean soils, loose and dense, moist and dry; to which some writers add calcareous (cretosa), in which lime predominates—and gritty (glariosa), where grit or gravel prevails—and carious (cariosa), of which different explanations have been given. Pliny compares it to rotten wood, being porous, dry, and rough, like broken pumice-stone; but whatever it really was, it was regarded with aversion as unproductive both in arable and pasture-lands.

It is interesting to observe how fully the Roman husbandman appreciated the value of draining, and how nearly the directions of Columella on this head correspond with modern practice. Although Cato uses the word *tegula* in connection with draining, we cannot, of course, imagine that anything like modern tile-draining was known; but it is not improbable that tiles were used to prop up the sides of the drain, and afford a clearer channel for the water to escape. The drains, says Columella, may either be open or covered in; the latter kind, however, should be partially adopted in a loose soil, the covered ones communicating with the main drains, which may be open, and made inclined like the eaves of a house, so that they may not fall in. It is proper, indeed, to make both the open and covered drains shelving, broad at top and narrow at bottom, like roof-tiles turned upside down; for those whose sides are perpendicular are soon damaged by the water, and are stopped up by the falling in of the earth from above. Again, the covered drains are to be made three feet deep, half filled with small stones or clean gravel—the earth that was dug out being thrown over them. If neither stones nor gravel are to be got, he advises that twigs should be twisted like a rope, and formed to the exact thickness of the bottom of the drain, so as to be enclosed in it when tightly pressed down; and then that cypress or pine leaves should be pressed down upon it—taking care, however, that at both ends of the drain two stones should be placed upright like pillars, having another laid over their top, to support the bank, and give a free ingress and egress to the water.

Improvement of the soil by burning it, in the way now practised, can scarcely be said to be referred to by the Roman writers; for there can be little doubt that Virgil's graphical description merely refers to the stubble or rank vegetation covering the surface. In certain soils, containing much undecayed vegetable matter, all the beneficial effects he ascribes to this superficial burning may be produced, and the quality of the soil affected even to some depth. Whether it communicates, he says, rich juices to the land or corrects bad ones—opens the pores of the soil to allow the nutritious juices access to the young plants, or renders it more compact—so as to prevent its being injured, either by the showers, the excessive heat of summer, or the severe cold of winter. The advantages now expected to arise from the practice of burning the soil and the plants on its surface are very nearly those which Virgil contemplates. When there is much vegetable matter decomposing but slowly, it accelerates the return into the body of the soil of the alkaline and earthy constituents of the plants, so as to render these essential ingredients immediately available for the ensuing crop. It is thus that, to translate his words literally, "the land receives secret strength and rich nourishment." According to Dr Daubeny, this is the source of the fertility imparted to the soil of America by the combustion of the timber in its extensive forests; the fire unlocking, as it were, these accumulations of potass, phosphate of lime, and other valuable matters, which the trees in their growth had gradually drawn from the soil, and restoring them at once in a condition in which they can minister to the wants of the forthcoming crops. Further, when the soil is sour, or contains peaty matter, which generates acetic or other acids prejudicial to the growth of plants, the practice of burning dissipates and destroys the injurious principle; or, as Virgil says, "every prejudicial quality is burnt out by the fire, and the superfluous moisture exhaled." The circumstance, not adverted to by Dr Daubeny, which appears to us to prove that Virgil in this description meant nothing more than burning the stubble and superficial herbage, is, that he makes no allusion to paring, or cutting up the surface into turfs, without which, burning the soil, in the modern sense of that operation, could not take place.*

* Mr Hoskyns, we perceive, speaks of the frequently quoted passage of Virgil on *paring* and burning. But this is merely an inference of his own, from the difficulty of conceiving how the fields could be burnt (*incendere agros*) without such a process. There is not a word in the passage which bears the remotest reference to paring; and it is worthy of remark, that none of the older Roman writers on agriculture make any allusion to the practice, though fully aware of the fertilising effects arising from the ashes of timber, brushwood, and stubble, which in certain cases they therefore recommend to be burnt for the purpose of enriching the soil. But though not a practice known to the Romans, paring is one of very old date; for we learn from Crescentius, who wrote in the thirteenth century, that it was followed by the inhabitants of the Alps five hundred years ago. He says, "When there are

The further back we go in the history of Roman husbandry, the less importance shall we find attached to the manuring of the soil. Cato, indeed, recommends that large manure-heaps should be got together—that the dung should be carefully preserved, and spread over the fields at certain seasons. But he further goes on to say, that if asked what was the first point in good husbandry, he should answer—good ploughing; what the second—ploughing of any kind; what the third—manuring: thus indicating the subordinate place he would assign to the latter. It is probable that in his time much of the land had been but little cropped; that it retained, therefore, much of its original fertility, and required only to be properly stirred and pulverised to yield an abundant produce. But as the population increased, more had to be exacted from it, and its productive powers would become more and more exhausted. The necessity of recruiting it by means of manures became more obvious, and in the time of Columella their importance was fully acknowledged. He accordingly treats this branch of the subject at considerable length. The substances employed in this way pretty nearly correspond to those now in use, with some curious exceptions. What are now called special manures appear to have been unknown. At a time when sheep and cattle were seldom reared for their flesh as an article of food, poultry of various kinds were held in high estimation, and reared in much greater abundance than is generally the case at present. A considerable quantity of dung was obtained from this source, and its superior efficacy was well known, although we do not recollect of any reference to the cause of this superiority, namely, that in birds there is no ultimate separation between the solid and liquid secretions. Pigeons' dung was considered the richest; and this opinion, derived from observation, coincides with the result of chemical analysis, Boussingault having found that it contains 8.3 per cent of nitrogen, equivalent to 10.0 of ammonia; a manurial value of more than half that of guano; but it varies greatly in composition. It was sometimes used in a dry state, and sown with the hand exact[illegible] is [illegible] with guano, and in this way was occasionall[illegible] dressing for corn-fields. Next to this in va[illegible] [illegible]ked the droppings of barn-door fow[illegible] different in their effects from th[illegible] the du[illegible] two-footed birds, particularly that [illegible] considered [illegible]s, because, doubtless, it [illegible] which it happened to [illegible] shown that this was

[illegible] ploughed in), the [illegible] portion [illegible] earth are [illegible]d off, and, after being dried, is [illegible] *[illegible] terræ incid[illegible]r*, just [illegible]

owing to its being too concentrated, and that means might easily be adopted for rendering it beneficial, although it is inferior to that of birds more exclusively granivorous. It is probably from what he had observed in such miscellaneous feeders as domesticated ducks and geese, that Varro excludes the dung of sea-birds, which are also web-footed, from the list of useful manures; a curious exception, when we consider that, under the name of guano, it is the most fertilising of any substance we know. "Of the dung of cattle," says Daubeny in his synoptical view of Columella's work, "that of the ass is said to be the best,* then of sheep, then of goats, then of horses and oxen, while pigs' dung stands lowest in the scale. When stable-dung cannot be obtained, the farmer should collect leaves, scrapings of the sheep-pen, ashes, the contents of privies, &c., to supply its place; and these are to remain until the seeds of the plants which they contain have rotted away."

"The dung should not be more than a year old, as its virtue is afterwards impaired. Accordingly, if a field is to be sowed with wheat in autumn, it should be dunged in September; if in the spring, in the previous winter. Eighteen loads of dung suffice for an acre of level ground, twenty-four for an upland one. The heaps ought not to be spread over the land before the ploughing begins; and if anything has prevented your doing it at that time, you should scatter afterwards the pulverised dung from the aviaries over the land, as you do the seed. If dung be wanting, it is useful to spread chalk over sandy places, and sand over chalky ones. Or if this cannot be done, lupines should be sown and ploughed in."

Dr Daubeny remarks, regarding this account, that it does not show much discrimination as to the particular uses of these several substances, for it cannot be admitted that lupines, as a fallow, will do to take the place of stable-dung, nor even that chalk or *marl*, *as such*, can be substituted.

"Nevertheless," he adds, "it is not improbable, from the recent discoveries made with respect to the presence of large quantities of phosphate of lime in the greensand, and in other of the rocks, and from beds containing an abundant supply of this ingredient being called *marls*, as we are told is the case in Hampshire, that the virtue the ancients attributed to marl in agriculture may in some cases have been owing to the phosphate present in them; in which case they would really be a fair and proper substitute for stable-manure. Pliny speaks of various sorts of marls, and states that in Britain it has been used as a good dressing to land for eighty years; and that one sort of marl is raised in lumps like stones, and is reduced to

* The reason given by Columella for this preference is curious, namely, because this animal chews very slowly, and digests its food thoroughly, which causes the dung to be well prepared, and fit for being immediately applied to the fields. If this is an advantage, will it not be found particularly in the ruminants, from which we obtain so much of our common manures?

shivers by the rain and frost. This may refer to the Farnham phosphorite, as his description precisely corresponds to the little lumps of marl found in the greensand at Farnham, impregnated with phosphorite."—(P. 135.)

The management of dunghills was a matter of greater attention than it often is with the farmers of the present day. There were two dunghills on every farm, one for receiving the dung from the offices, the other for preparing it for use; for they were of opinion that it should lie a year before being used for either corn or vines. The place where it was collected was deepened in the middle—a kind of large basin, paved in the bottom. This was to preserve the moisture; and, to promote the same object, the sides were built up, and the top covered with woven branches of trees and shrubs; measures which were necessary in a warm climate to retard evaporation, and prevent the sun and wind drying the dung too much. At certain seasons the dunghills were carefully turned over and the materials thoroughly mixed. Occasionally the dung of different animals was kept separate, and each kind used for the purpose for which it had been found best adapted; at other times, all kind of substances, including sea-weed, the mud of rivers, &c., were mixed and incorporated in one heap. It is probable that the liquids from the cattle-houses was occasionally conveyed to this general reservoir. We do not find any notice of liquid manure having been applied by itself.

In applying manure to the land, Columella lays stress upon ploughing it in and covering it over immediately with earth, so that it may not lose its strength with the influence of the sun, and may impart all its virtues to the soil. Hence, when heaps of dung are brought to the land, a larger quantity ought not to be scattered over it than what the labourers can cover the same day. In reference to this, Dr Daubeny remarks, that it is satisfactory to have the sanction of a practical writer like Columella to the correctness of a rule which scientific principles of farming would lead us to inculcate. If the ammoniacal contents of manure are of any value (of which it is scarcely possible to doubt), it is obvious that the common practice of allowing the dung to remain in little heaps on the surface long before it is ploughed in, must be wasteful, by allowing the escape of the volatile matters which would otherwise go to enrich the soil.

Lime, which has exercised such a magical influence on our cold soils of the north, and has been perhaps the principal agent in rendering our agriculture what it now is, does not appear to have been much used by the Romans to increase the fertility of their corn-lands. Yet its manurial value was known to them; and it is referred to particularly by Cato, though not mentioned by Dr Daubeny in the analysis he gives of his work. Palladius mentions the kind of stones, tiburtine and marble, from which it was chiefly

, and Cato describes the best kind of kiln for burning it. f peculiarity in the mode of burning it was, that the stones were kept separate, the fire being placed under a layer nestone, instead of the two being mingled together, as is case; a measure perhaps rendered necessary by the fuel g of wood—not coal. In the time of Pliny, the Gauls, in ts of the country, used lime with success as a manure for n-fields: it was employed in Italy to improve the growth and olives, and, when applied to the roots of cherry-trees, hought to hasten the ripening of the fruit. So anxious Romans to obtain fertilising substances, that the circum- lime not having come into general use among them, was owing to its not producing the same beneficial effects land as it has done in so remarkable a degree in this

preparation of the land for the crop, the different imple- ust always occupy a prominent place; and in considering used by the Romans, we cannot help being at once struck ir rude simplicity. In none of its aspects does modern ry appear to such advantage as in this; it is in vain to any comparison here. The mechanical skill, inventive y, and admirable workmanship, displayed in modern agri- implements, could never have been even imagined in the tate of the arts. The climate and soil of Italy, in general, such easy returns, that, for want of stimulus to exertion, e left even farther behind in this respect than they might e have been. Yet, in regard to the plough, that triumph nism, combining so much simplicity of construction with and power, the principle is essentially the same now as en, however much it may be improved in its details. They turn derived it from remote antiquity, and do not appear materially improved it. Recent discoveries in Eastern s, the ancient seats of civilisation, have thrown new lights istory of the plough; and we can now trace its rise and from its most rudimentary state, till it most perfectly the idea which it embodies. Some form of hoe was pro- e earliest implement used in cultivating the ground. "To nd the form and origin of the plough," says Mr Hoskyns, cessary to bear in mind that it was undoubtedly a substi- strument, intended to accomplish more expeditiously, and ger scale, by means of animal draught, that which would, rst instance, be the work of a simple tool used by the hand. country, we should at once pronounce that tool to be the but if we go no further off than the shores of Spain and l, we shall be induced to pause before we award the palm uity to that instrument. There we find that the imple- single-handed cultivation is not the spade, but what we

should describe as a sort of hoe, with a very long blade. With this the workman cleans the ground, using it as we do a pickaxe, dragging towards him the broken soil, as he stands on which, the treading of his feet helps, *in a dry climate*, to break the clods as they are torn away from the land-side, as the farmer would call it. I have often been surprised, when watching its use both in Portugal and Madeira, at the efficiency with which it performs its task, tearing up the soil to the depth of two and even three feet. It is an instrument with one long blade, but bent to a more acute angle with the handle than either of the blades of the pickaxe, and sometimes connected with it by a cross-bar of wood or iron, reminding one of the capital letter A, with one leg shorter than the other."*

The gradual transition from this form of the hoe to the plough is well traced in some of the painted sculptures found by M. Costaz, a Frenchman attached to the scientific corps under Napoleon in Egypt, which, according to Sir Gardner Wilkinson, were taken from a Theban tomb on the 18th or the beginning of the 19th dynasty. These are well described by Dr Daubeny. In one of them, two men are represented turning up the sod with a hoe of the kind described above. "In another of these sculptures," he continues, "we have a delineation of the second stage in the transmutation of this implement into the plough, in which the beak of the hoe appears to perform the part of the ploughshare, and in which the handle, being elongated, is dragged along by two men. But as the tendency of the force applied in front would be to draw the share out of the ground, or to cause it merely to graze along its surface, it became necessary to apply pressure behind, which was weighed down by the force of two men leaning upon it. Hence, in this operation, four men are seen to be employed—two to drag the instrument along, and two men to thrust the point of the ploughshare into the ground.

"The substitution of oxen for men to perform the act of drawing was the next obvious stage in the progress of improvement; and this also we see exhibited in another of the sculptures on this grotto, where the same rude instrument as before is represented, dragged along, however, by two oxen, whilst a man follows, whose business is to force down the point of the instrument into the soil.

"The use of oxen would call for another modification in the form of the machine, for it now became necessary to direct it, as well as to keep it steadily fixed in the soil; and for this purpose the handle was first furnished with a ring, but was afterwards made double, by which latter contrivance the husbandman was enabled to act upon the plough with both his hands, and thus not only to force it into the soil, but also to direct it in a straight course."—(P. 97.)

* *A Short Inquiry into the History of Agriculture*, p. 27.

The plough in this form is not very different from what is now used in many Eastern countries, but it would probably receive further modifications at an early time. Its action, as above described, would be rather like that of the tine of a grubber than a modern plough; in stirring the soil, it would throw it off irregularly, although nearly equally, on both sides of its course. The convenience of throwing it chiefly to the one side, in order to leave a clear trench to receive the next furrow-slice, would be early felt; and this would be easily accomplished by giving a twist to the blade of the instrument, so that it would act obliquely and turn the soil to one side, an arrangement which would have the further advantage of presenting an edge instead of a flat side to the soil as it went along. This done, we find in the instrument all the main features of a plough as now constructed. Mould-boards appear to have been added at times to serve particular purposes, such as covering over the seed in the ridges, and making furrows to carry off the rain. The addition of wheels was occasionally resorted to; but this does not appear to have been common, and no express mention is made of them by Virgil.

The Romans invariably represent ploughing as the most important operation of agriculture. The directions, accordingly, given by Columella, as well as other writers, on this head, are very precise, and must be admitted to be judicious and practical. The land was never to be ploughed when wet; in order completely to pulverise the soil, cross-ploughing was to be resorted to; the furrows were to be narrow and close, so that all roots and weeds might be destroyed; and the surface left so equal, that few or no traces of the plough could be perceived. Particular care was to be taken by the ploughman not to make an unequal furrow, one varying in breadth and in depth—"Sulco vario ne ares;" and when the ridges were thrown up, they were to be perfectly straight. So much were these two points insisted on, that they gave rise to the primary meaning of two words which are now in common use in a figurative sense. To plough with an irregular furrow (vario sulco) was to *prevaricate*, a term afterwards transferred to a witness in the law courts who deviated from the truth. The ridge thrown up by the plough was called *lira;* if that was formed irregularly, the ploughman was said *delirare*, a term which, under the form of *delirious*, we now use to signify only mental aberration. Three, if not four, ploughings were commonly given to the land by the Roman farmers in the time of Columella, and Virgil recommends that corn-land should be ploughed twice in cold, and four times in warm weather. The last operation was to throw up ridges for the reception of the seed, without which they could not have been properly covered in. The ancients had probably no acquaintance with what we now call subsoil or trench ploughing; but they appear to have occasionally ploughed to the depth of nine inches, which

considerably exceeds the general practice of the present day. I the labour thus bestowed on the preparation of the land appear great, we must remember that the furrows were generally of smal extent, so that in many cases the treatment might be regarded i the light of an extended horticulture. The importance they attache to the different seasons and operations of ploughing may be in ferred from the fact that, of the twelve inferior gods who preside over agriculture, four were specially invoked while the different acts of tillage were in progress.

Dr Daubeny is of opinion that a different mode of sowing pre vailed, according to the nature of the land. On wet soils the seed was deposited in ridges, the ground being turned up either by plough with two mould-boards, or by two turns of one with single mould-board, after the seed had been scattered. On dr ground, on the contrary, the ground was first ridged, and the see then introduced into the intervening furrows. The gracef mode of casting the seed from the hand was alone followed; an when the plants came up in drills, it was owing to the seed fallin into the hollows of the ridges previously made by the plough. An implement resembling the diversified and elaborate sowing-dril of modern times, by which the seed-rows can be adjusted so readil to any width, and the seed to any required quantity, it is scarcel necessary to say, had not then been thought of. Drills were gene rally adopted for the purpose of admitting of hoeing and cleanin the crop. The process is well described by Mr Dickson, but too great length to admit of his account being here given. W may mention, more especially as the important fact has been som how or other omitted in the *Book of the Farm*, that, according Columella, the seed-basket should be covered with *the skin of hyena*, which has such a wonderful effect that, by being thus treate the seeds will inevitably spring!

Thick and thin sowing appears to have been a matter of discu sion among the Roman agriculturists as among us in the prese day; a task of such time and labour it is to establish the found tions of truth! Columella enters into calculations as to the qua tity it is advisable to sow; and this varied with the nature of t land. The quantity of wheat to be sown to an acre (*jugerum*)* from 4 to 5 modii; the modius rather exceeding an English pec It will be found from calculation, that the proportion recommend does not differ greatly from that generally adopted in the prese day. Columella seems to be in favour of thin-sowing in rich a loose soil, because the plants tiller, and thus become more productiv

"The care of the Romans in regard to the season of sowi

* A jugerum comprehended 26,930.56 square feet, English. The English a contains 43,560 square feet; the Roman measure, therefore, is only .618 parts an English acre. The Scotch acre contains 54,760 square feet; the jugerum, the acre, is only .491 parts of a Scotch acre.

and proportioning the seed to the land," says Mr Dickson, "was remarkable. They sowed their wet lands before their dry lands, because upon the wet lands the seed sooner vegetated, and therefore was in less danger of being destroyed by drought and heat; and because these lands were in greater danger of being hurt by rain in autumn, and thereby rendered unfit for being ploughed and sown. They sowed the greatest quantity of seed upon the stiff wet lands, because the seed, being ploughed in, was covered deep, and the land being raised in clods, prevented the whole seed thus covered from coming up. Upon light lands, whether rich or poor, they sowed a smaller quantity, because the whole seed in these lands came up: besides, upon the rich land the plants tiller or stool, by which a thin-sowing produces a thick enough crop; and upon the poor lands, unless the crop is thin, the ear is short and the grain small. Our care in adapting the quantity of seed to the ground falls greatly short of that of the Romans; we have only one general maxim, and that is, to sow less or more, as the land is rich and clean, or poor and foul. Every British farmer, however, capable of giving attention to things, must be convinced of the propriety of the practices of the Roman farmers, and perhaps may receive some benefit from attending to them, and in imitating them as far as circumstances will allow. There is one thing proper to be considered, in which their practice differed greatly from ours; they sowed a smaller quantity upon the light poor lands than upon the rich wet clays, whereas we commonly sow a larger quantity. This difference naturally arises from the different methods of culture used. Our poor lands are commonly full of weeds, and hence it becomes necessary to sow a large quantity of seed to prevent the weeds from destroying the crop. But in the Roman husbandry, this kind of land being fallowed for every crop, few weeds came up with the seed, and these few were destroyed by the hoe and in weeding; the seed, therefore, might be sown as thin as the nature of the soil would allow. Were the poor light land in Britain managed after the manner of the Roman husbandry, it would certainly require much less seed than under its present management." * The selection of the finest and most healthy seeds was likewise a matter of attention with the Romans; and in connection with this subject, it may be worth while to mention what they have stated regarding the vitality of seeds—a subject on which certain experiments are now in progress. Varro affirms that wheat preserves its vitality for 50 years, millet for 100 years, and beans for 120. From the experiments instituted under the direction of Dr Daubeny, of which an account has been given in the Transactions of the British Association for the Advancement of Science, their vitality appears to be by no means so prolonged, certain of the leguminosæ only

* *Husbandry of the Ancients*, vol. ii. p. 36.

retaining the power of vegetation after 40 years. But in many well-authenticated instances, seeds have retained the power of vegetating, under certain circumstances, for a very long period, even for many centuries. Much will, no doubt, depend on the nature and composition of the seed, and also the manner in which it is preserved.

After the seeds had been scattered over the surface, the ground was subjected to a kind of harrowing in order to cover them in. A kind of beam, furnished with many teeth, and drawn by oxen—also a sort of wicker-work, or hurdle armed with iron teeth, called *crates*—were used for this purpose, and corresponded in their action with our harrows, although they were very different in structure and appearance. The *rastrum*, which we are accustomed to translate harrow, seems rather to have been a rake used in manual labour than an implement drawn by oxen. It was employed for mixing dung in dunghills—that recommended by Cato having four teeth, which were probably often of iron; but when the instrument was applied to lighter work, the prongs were of wood.

Rotation of cropping can scarcely be said to be a practice the ancients were qualified to appreciate. It may be said, indeed, to have been practised by ourselves before the beautiful principle on which it depends was fully understood by us. It was not till the chemistry of the soil, and the anatomy and physiology of plants, had made considerable advancement, that the full import of the system could be perceived. It has, indeed, been alleged that it was wholly unknown to the Romans. The ordinary arrangement certainly was to fallow and crop on alternate years; but occasionally lands were constantly cropped, or at least carried two or more crops in succession. In these cases there seem to be expressions from which we may infer that endeavours were made to save the soil from exhaustion by a change in the nature of the crop. Thus Varro says that the land should be left fallow on alternate years; or if not, sown with lighter or more easy crops (*levioribus sationibus*), which exhaust the land less. It seems more distinctly pointed to in a line of Virgil, which, as far as we have noticed, has hitherto been overlooked, and which may be translated, "The land will rest (that is, will not be exhausted, but remain, as it were, in the same heart as if it had been fallow) by a change of crop."* But whatever may have been the extent of knowledge possessed by the Romans on this matter, it does not appear to have been such as to enable them to make it the basis of any general system of culture.

In all that relates to the treatment of grown corn, a very great inferiority is observable in the practice of the Romans when compared with that of modern times. The dissimilarity in the two modes of treatment has partly arisen from difference of climate,

* "Sic quoque mutatis requiescunt fetibus arva."—*Geor.*, lib. i. 83.

ferent objects being aimed at in cultivation; and our supe- is chiefly owing to the numerous mechanical inventions y introduced, a department in which the Romans were so re. Not to speak of the reaping-machine, of which the ies are not yet fully developed, what an amount of man- our, at best inefficient in such cases, has been saved by ferent kinds of fanners, for example, and the thrashing- e! It is not easy to fancy anything more rude and pri- than beating out corn by the trampling of cattle, and it in the air to be winnowed by the winds. As far as to reaping, however, the practices are much the same. In rthern clime, corn cannot be reaped till it be fully ripe, or so; when it is cut prematurely, which the approach of sometimes renders necessary, it is always at a loss; hence verb, *a green shear is a bad shake.* But the Roman writers ost unanimous in recommending to reap before the corn be ipe, and Columella declares that it ripens after it is cut. lieve that this is generally admitted. The juices in the re not exhausted by cutting; they continue therefore to for a while in the natural manner, nourishing the grain to y, which may come on earlier from superabundant nutri- eing cut off. Pliny says that the later wheat is in being it gives the more flour; and the sooner it is reaped, it is er and plumper. It is a maxim that it is better to reap two o soon than be two days too late. In reference to the tion that the grain is fairer and plumper, which appears at paradoxical, Mr Dickson states, that in hot countries a y warm days, when wheat is nearly ready, whiten it on a , which makes the grain shrivelled. Possibly when the corn own and laid together, the heat has not such an influence acting the juices from the stalks as when they are stand- osed, and consequently allow more of them to go to the ment of the grain. At the same time, this plumper grain t be so solid as that which is more exposed to the sun, and re will not give so much flour to the bulk.

ing-hooks were the principal implements used in cutting ps. The stalks were sometimes cut off in the middle with and the ears detached by a pair of shears. In other cases n was pulled up by the roots. This was the case, in par- with different kinds of pulse, just as it occasionally is in sent day with beans, and more or less with pease, most of in the ordinary mode of reaping come up by the root. it became customary, according to Varro, to call such plants, e mode of gathering them, *legumes* (*a legendo*), whence we ur common word *leguminous*. The straw of white-corn as accounted of little value in the general economy of the nd it was generally thought to be disposed of to the best

advantage when left on the ground to be returned to the soil. An instrument of a peculiar kind is described by Pliny, which is curious from its resemblance to the modern reaping-machine. "In the extensive plains of Gaul," he says, "large hollow machines are employed, with teeth fixed to the fore part, and they are pushed foreward on two wheels, through the standing corn, by an ox yoked to the hind part; the ears, cut off by the teeth, fall into the hollow part of the machine." The general appearance of this implement must have approached very nearly to that of Bell's reaping-machine, and may have done its work very effectively when the corn was standing erect, and the ears alone gathered. An instrument called *a pecten*, worked by the hand, was employed to strip off the ears; and this was sometimes done after the corn had been cut with the hook, much in the same way as flax used to be rippled. When the straw was required for thatching, it was cut near the root, as is done now. The Old Testament narratives show that it was customary to bind the cut corn into sheaves in the earliest periods of which we have any record. This was likewise the case in Homer's time, and continued afterwards to be the general practice in Greece. From anything we can learn from Roman writers, this was never done, or at least was not customary, among their agriculturists; and they were probably led to abandon the practice by being so often in the habit of cutting off merely the ears or upper parts of the plant.

"If the grain be cut with a part of its straw attached, it is carried into a shed, the nubilarium, and kept till a favourable day for drying it occurs. If, on the contrary, the ears only are cut, they are taken into the granary, and in the winter thrashed out with flails, or trodden out by cattle. In the latter case, a *tribulum*, or *trahæ*, may be added. This was a thick wooden board, armed underneath with spikes of iron or sharp flints, and pressed down by a heavy weight placed upon it, so that, when drawn over the corn by the oxen, it separated the grain from the straw. Hence by Christian writers the term *tribulation* has been used, to express their sorrow and trials, which tend to separate in men whatever is light, trivial, or poor, from the solid and the true—their chaff, in in short, from their wheat.

"The grain is then spread over the thrashing-floor, in order that the wind may carry away the chaff; but the latter must be separated by winnowing, if after some days this is not found to be done; for there is always a risk that a long succession of calm days is the prelude to a storm, which may be violent enough to sweep away the fruits of our year's labour altogether if not properly housed."*

The chief implements employed in winnowing were the *ventila-*

* DAUBENY, p. 140.

brum, a kind of shovel for throwing the corn upwards and scattering it that it might be fully exposed to the action of the wind; and the *vannus*, the precise nature of which is not very well known, but it appears to have been capable of cleaning the corn from the chaff when there was no wind.

We cannot in this cursory notice allude to every feature of interest in Roman agriculture, but must refer the reader to Dr Daubeny's work, and more particularly to that of Mr Dickson, where every branch is treated in a highly satisfactory manner. There are a few points, however, to which we must still advert, that inadequate notions of it may not be conceived by those to whom the subject may be comparatively new.

Feeding of cattle, in order that they might be slaughtered for food, being little practised, it might seem that pasture lands would not receive so much attention as corn crops. This, however, was by no means the case. A large supply of hay and grass was required for the working oxen; meadow and pasture land were therefore regarded as of the greatest importance, and received a corresponding degree of attention. According to Columella, the earlier Romans assigned to them the first place in agriculture; but that refers to a period when they were chiefly a pastoral people; afterwards the case was altered, and Cato ranks them only in the fifth place, when mentioning fields in the order of their comparative value. Their merits were, that they were not injured like other fields by storms; they occasioned little expense, and afforded a return every year, not only in pasturage, but in hay. From these considerations, they came to be called *prata*, which is a contraction of *parata*, as their produce was always ready and available. Grass lands were of two kinds, dry and irrigated. Irrigation was managed much in the same way as at present; and very particular directions are given both for making new meadows and renewing old ones when they have ceased to be productive. Dung was applied to them under particular circumstances, and all noxious weeds removed. Moss on old pastures is best destroyed by the frequent application of ashes. We are accustomed to burn heath and coarse plants for the purpose of giving facilities for the growth of a finer herbage. A process similar to this muirburn was adopted by them with old and rough grass lands, which were set fire to in autumn. The meadows were generally cut twice, sometimes four times, even though not watered. It is not easy to determine the quantity of hay raised in this manner, but an approximation may be made. A good workman was able in a day to mow a *jugerum*, and to bind 1200 bundles of hay of four pounds each. It thus seems probable that this is the quantity a jugerum of good meadow-land was accustomed to produce when made into hay. Now, 1200 bundles, at four pounds, make 4800 pounds Roman, which are equal to 3600 pounds avoirdupois. This is the quantity on a jugerum, and is

nearly equal to 5825 pounds avoirdupois on the English acre, and 7332 pounds, or 327 stones tron weight, on the Scotch acre. Besides this, there were the rakings of the meadows, the grass left by the mowers at first cutting, and the second or autumnal crop; so that the whole produce must have been' considerable, and the returns frequent, compared with those of the cornfields, which for the most part had only one crop in two years. The hay was put up in bundles, and after being conveyed home was placed under cover.

The fodder thus prepared was for the use of horses and cattle, particularly the latter, regarding which we may now say a few words. In comparing ancient agriculture with modern, the ox and the horse may be said to have completely changed places; horses were never used then, and oxen are but little in request now, at least in Britain. Yet it is obvious that great attention must have been bestowed in ancient times on the breeding and rearing of horses, although we find comparatively little notice taken of them in annals strictly agricultural. The continual demand for them for the chariot, the chase, and above all for war, must have prevented this branch of rural industry ever falling into neglect, and the production of food necessary for their support must have naturally had a great influence on the management of the farm. Brood mares were frequently kept in large troops, which were removed, according to the season, from the mountains to the coast, and studiously kept apart from the males, except at the breeding season. Virgil's description, and certain remains of ancient sculpture, are sufficient proofs that they were well acquainted with the good points of this animal, and that they were in possession of excellent breeds.*

It has been already noticed that beef and mutton were very little used by the Romans; indeed we can scarcely help feeling some surprise at certain statements their writers make on this subject. In the few places where Pliny mentions beef, either roasted or taken as broth, it is recommended as a medicine, and not as an article of diet. In the Latin language, according to Dr Daubeny, there is no single word for beef, mutton, or veal, just as is the case in our own Saxon English, the French words for these articles of food being generally adopted, because the latter were chiefly consumed by our Norman conquerors. Yet the disuse of animal food cannot have been so complete as these considerations would seem to imply. The flesh of the oxen sacrificed to the gods must have been consumed by the priests and their attendants; and it is hardly to be supposed that their immense armies could be sustained without attendant

* Whenever the ancient writers touch upon any branch of physiology, we are almost certain to encounter some absurdity. It appears to have been at one time believed, and Virgil recounts the fable with the gravity due to truth, that when mares at a certain season are debarred from intercourse with the other sex, they *conceive by the winds*, and engendered an offspring which died within three years!

droves of cattle and sheep. Plautus, indeed, expressly mentions that the markets in his time were supplied with beef, mutton, and lamb, as well as pork and venison. These commodities, therefore, were coming into more common use, although the climate is ill fitted for preserving animal food, and its stimulating qualities render it less wholesome than fruits and vegetables. While the banquet of a northern baron, therefore, would have been nothing without its crowning sirloin, such an *entrée* would have been an anomaly and a disgrace to the supper of an Apicius. But however these things may have been, it is certain that the breeding and fattening of cattle for the shambles is never spoken of by the Roman writers as an object calling for the attention of their farmers; and thus one of the great branches of modern husbandry had scarcely anything to represent it in Roman times.

But the agricultural ox receives all due attention and honour. Almost with a shudder we read that it was at one time as great a crime to slay an ox as a citizen; that is to say, it was a capital crime, and instances of condemnation are on record for killing the husbandman's companion and friend. No longer requiring his services, it is to be feared that we have suffered his intelligence to degenerate till he enjoys amongst us the reputation of being one of the most stupid of animals, with nothing interesting about him except what he derives from being a mass of living beef. But formerly, when well treated and carefully broken in, for which special instructions are given, oxen appear to have been docile and tractable, and when equally matched in the yoke, to have accomplished with ease a considerable amount of work at much less expense than could have been done by horses, both as regards the original expense of purchase and the nature of the food. Columella recommends that, when the country is fertile enough to afford abundance of green herbage, the latter is to be preferred to all other kinds of food for oxen; but where this is not to be had, vetches, chick-pease (*cicercula*, the *Cicer arietinum* of modern botanists), barley, in case of hard work; lupines, straw, and leaves of various trees, especially of the elm, the ash, and the poplar, grape-stones bruised, and acorns, were given according to the season.

Although, whenever the nature of the soil and of the culture permitted, oxen were allowed to pasture, yet stall-feeding was not unknown; and it was the custom in winter to keep them in spacious stalls, built with a southerly aspect, and sheltered from cold winds, with a paved and sloping floor, and abundance of litter. Lumps of salt were placed near their stalls.*

It is curious to observe that the good points in the development of cattle, as described by the *Rei Rustici Scriptores*, very nearly

* Daubeny, p. 179.

correspond to those most esteemed by modern breeders. They were of opinion that the qualities of the offspring depended most on the make of the mother, and they were therefore more careful in the selection of breeding cows than bulls. Milking qualities were little regarded, and dairy farming can scarcely be said to have been practised among them. In the warm countries of the south, milk and its products are held in little estimation; in China, for example, they are scarcely known. The word *butyrum* (butter) occurs only once in Columella, and it is there spoken of as an application to a wound in a sheep. It would, indeed, be scarcely possible to keep it for any length of time without becoming rancid. In all European countries south of the Alps, its place is supplied by vegetable oils, which are found to be much more wholesome and palatable. Milk, and such of its products as were in use, were obtained almost entirely from sheep—occasionally from goats.

The extent and perfection to which the rearing of sheep is now practised, affords as striking a feature of contrast between Roman and modern husbandry as the breeding and fattening of cattle for the supply of the table. In a much more strict and literal sense than when the expression was first used by the sacred writer, our " pastures are clothed with flocks," and the animals themselves have attained a size and weight, as well as a fineness and profusion of fleece, of which in former times they could scarcely have been thought susceptible. As with cattle, sheep were seldom fattened by the Romans for the sake of their flesh; their fleece and milk were almost the sole objects. Even in Spain, at the present day, the flesh of the merino is seldom eaten except from necessity. None of their management, therefore, was directed to the development of fat and muscle, but chiefly to the improvement of the wool. We are not well acquainted with the character of their breeds. Pliny tells us that the wool of Tarentum was admired for its black colour; it was from a breed obtained from Miletus, in Ionia, and yielded the " Milesia vellera" extolled by Virgil. The wool of Canusium was of a fine brown or yellowish colour. The Tarentine sheep are still of this colour—a circumstance attributed to their eating a particular species of St Johnswort, the *Hypericum crispum*. Dark-coloured and brown sheep, belonging to Polentia, in Italy, and Cordova, in Spain, were also much in request; and there were, as at present, white breeds, similar to our own. The chill dewy nights of Italy produced a considerable vicissitude of temperature after the heats of the day; and Columella, therefore, recommends that the sheep should be covered in the night with skins (*pellitæ*), which would repel the moisture better than the thick woollen cloth with which they are bratted in this country, and serve the purpose nearly as well as the water-proof coverings suggested by Mr Stephens. In the summer season, it was customary to remove the sheep from the lower to the higher grounds; those of Apulia, for

example, were taken to pass the summer on the mountains of Samnium, and sometimes even those of Reate. These migrations still take place in the present day; and though intended chiefly for the benefit of the sheep, a portion of almost all kinds of domesticated animals are associated with them. Virgil appears to make a distinction between the kinds of pasturage best fitted for the production of wool and the secretion of milk—a distinction which Dr Daubeny says is a correct one, but which, it is to be feared, we cannot fully appreciate, from the uncertainty that attaches to some of the plants mentioned. Some of the kinds referred to as favourable for milk are, however, certainly leguminous; and Liebig has shown that plants of that natural family contain a principle named legumine, which is identical with the caseine of milk, and therefore well fitted to enrich that secretion—a fact well worthy of being kept in mind by our dairy-keepers, whose cattle are fed too much on grasses.

Ewe-milk is now in little request. In the Roman times, says Columella, the ewes not only supplied the husbandmen with abundance of cheese and milk, but adorned the tables of the wealthy with many agreeable dishes. The cheese is still met with here, and is valued by some. The only cheese of any reputation made from ewe-milk on the Continent is that of Rochefort. Two kinds are mentioned by Columella, the soft and the hard; the former, perhaps, resembling our cream cheeses, requiring to be eaten within a few days, while the other could be preserved for a length of time. Various plants were used to produce coagulation, such as the flower of the wild thistle, and the milky liquor of the unripe fig. Rennet, however, was not unknown, but, instead of being taken from the calf, as with us, it was obtained from the hare, the goat, or the lamb. "The milk was to be placed within a moderate distance of the fire, in order to become coagulated, and was then put into baskets, or into moulds, in order that the whey might run off. It was then subjected to pressure, salted, and stored on shelves, as with us."*

It must not, however, be supposed that, though little given to the consumption of beef and mutton, the Romans were in no respect carnivorous. They were in the habit of substituting for these a lighter kind of animal food, and one in many respects better adapted to their climate and habits. The rearing and fattening, not only of most of the fowls we now comprehend under the name of poultry, but also of many other birds, some of them ranked by us among our song-birds, was a matter of great importance to the farmer, and claimed a considerable share of his attention. Before the use of firearms, wild game, even though in request, would have been procured with difficulty; all, therefore, or most, which

* Daubeny, p. 182.

corresponds to our game and poultry, was derived from preserves. These preserves, consisting of small houses or pens, were called *ornithones*. The receptacle for singing-birds, kept for amusement, was distinguished from this by being named, as it is now, the *aviary*. Besides these, there was a *nessotrophium*, or piece of water for the reception of water-fowl, covered with a net that they might not escape, and sometimes enclosed with a wall 15 feet high. Besides the more common poultry, we find enumerated peacocks, turtle-doves, thrushes, and quails. The thrushes, which seem to have been in great demand, were kept in apartments capable of holding many thousand birds. As they were put in to be fattened, the place had only light enough to enable the birds to see their food. The instructions for fattening poultry, according to Dr Daubeny's version of Columella, are as follows:—

Their pen should be warm and almost dark, so confined that the birds may not have room to turn, but with two apertures, one for them to put out their heads, the other for their tails and buttocks to protrude. The floor is to be strewed with clean straw or soft hay, and the greatest cleanliness maintained; the feathers from the head and under the wings and loins being brushed repeatedly, and every kind of filth removed. Their food must be barley-meal mixed with water, given more sparingly at first, but the quantity gradually increased to the largest amount that the fowl can digest. After it has eaten to repletion, it is allowed a little liberty, not so as to roam about to any distance, but only to enable it to pick what it can find, for which it may have a fancy.

To render the fowl more tender, the water with which the meat is mixed is sweetened, and some add a little wine. Pigeons are fattened upon the same principle, young ones having their wing-feathers cut, to prevent flying, and their legs either tied or broken, to prevent their moving about in their coop. The latter practice seems not only cruel, but, from the pain it would occasion, likely to impede the fattening process. This, however, Columella denies, contending that, two or three days after the legs have been broken, they cease to suffer pain. The pigeon-houses of the Romans were often of great size. Varro mentions their holding 5000 birds each. They were vaulted or roofed in with tiles, and furnished with one small entrance, but well lighted with large barred or latticed windows. The walls, carefully stuccoed, were lined with round-shaped nests, with a single small aperture, often formed of earthenware, one of which was intended for each pair.

ON THE POSSESSION OF LAND AS AN INDUSTRIAL OCCUPATION FOR THE PEOPLE.*

By the Rev. DAVID ESDAILE.

(*Concluded.*)

AT the opening of the second session of the *first* Parliament of New South Wales, on the 11th August, his Excellency the Governor-General introduced into his speech the following paragraph: "A bill will be laid before you to provide for the future management of the public lands, which, while preserving the good faith of the Crown, will render the acquisition of land in fee-simple more easy to all who are likely to bring it into profitable use, and thus facilitate the permanent settlement, and at the same time increase the productiveness of the country. One of the most important objects of the measure will be to augment the means available for public improvements, and more especially for those great works of internal communication which are now so much desired, without unduly pressing upon any class of the community."

Considering what we have written in previous numbers of this Journal, regarding the impolicy of unduly discouraging man's strong natural desire to be the possessor of a portion of the earth on which he lives, and bearing in mind what blame we have attached to the Government of this country for mismanagement of Crown-lands, and for not devising comprehensive measures for bringing into cultivation immense sections of the United Kingdom lying waste, our readers will not be surprised at our quoting with satisfaction the measure proposed by the Governor-General of New South Wales. It is not to our credit that this *proto-parliament* at the antipodes should, in the matter of facilitating the acquisition of land in fee-simple, be so far in advance of the Imperial Parliament at home. While our legislators, by the laborious compilation of "Blue Books," are preparing the way for the introduction of land bills at some unknown period of a possibly distant futurity, the Australian legislature is about to discuss and settle questions which among us have only begun to be agitated, and the mere mention of which excites the horror of certain learned lords, and makes *The Law Times* exclaim, week after week since the publication of the report whose title is subjoined to that of this article, "Revolution, Revolution—Solicitors! to the rescue!"

Is the slowness of our Parliament in dealing with such questions a sign of the maturity of its wisdom? Or shall we ascribe it to

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* Report of the Commissioners appointed to consider the subject of the Registration of Title in reference to the Sale and Transfer of Land. 1857.

the torpor of senility, and regard the greater energy of our colonial brethren as a metempschychosis—a transmigration of the British soul to a new embodiment in an infant race, which, even in its cradle, shows the lineaments of a giant? We have no notion that Britain is *effete*, and that the spirit of stupidity and careless unconcern has its chosen haunt in the palace of Westminster. Still, we must confess that, in the treatment of the land question, we long for energetic legislative action: the means of forming an enlightened opinion have been accumulated by the intelligent labours of several parliamentary commissions; and the common sense of the country will not very long submit to be smothered under the growing weight of ponderous reports leading to no practical results. With all humility we pray our parliamentary representatives not to suppose themselves so old in senatorial sagacity that they can learn nothing from the thinkings and doings of young parliamentarians on the other side of the earth. We are right glad, at all events, to resume our observations "on the possession of land as an industrial occupation for the people" with a paragraph from the speech of his Excellency the Governor-General of New South Wales. The connection between that speech and our subject will appear on a moment's consideration.

The mission of our Anglo-Saxon race evidently is to be the pioneer of a world-wide civilisation, and to act no unimportant part in fulfilling the destiny at first assigned to man by the Almighty—that, namely, of possessing and subduing the earth. We have not been unmindful of the office thus assigned to us. The British Islands have been the seed-beds of nations; from them, across wide seas, have been borne those germs which shall yet be developed into every variety of

"Thrones and dominions, principalities and powers."

But parturition, whether by mother earth or by procreant peoples, is an exhaustive process. Britain, the mother of many nations, needs to husband her strength. It cannot be truly said that she has been a prudent manager of her own vigour, and a wise mother of her many children at home and abroad. With very little foresight or plan she has sent forth her sons to the ends of the earth. We are struck with the magnitude of the results, and amazed at the hap-hazard mode in which they have been brought about. Our emigrants straggle to North America annually by hundreds of thousands, but so uncared for by Government, that in Nova Scotia Sir Charles Lyell fell in with a settlement of Scottish Highlanders with whom he could have no conversation owing to their knowing no language but Gaelic. And immense portions of the North American continent have been intrusted to the Hudson's Bay Company, which has chosen to exclude human beings from Rupert's Land, and convert a fertile territory, as large as several European

kingdoms united, into a preserve for the rearing of fur-bearing animals.

The same want of thought is visible in the management of our home territories. Nobody among us disputes the antiquity and importance of agriculture, the most ancient of the arts; for Cain and Abel, who first kept sheep and tilled the ground, preceded Tubal-cain (the father of the mechanical arts) by six generations; and the most influential also, inasmuch as on the production and right employment and distribution of the substances with which it has to do, depend the existence of the human race, and the relative position of its various members. We cannot, therefore, wonder at the glowing panegyric of the eloquent Roman, and at the comparative disesteem with which he regarded the pursuits of commerce: "Omnium rerum ex quibus aliquid acquiritur, nihil est agriculturâ meliùs, nihil uberiùs, nihil dulciùs, nihil homine libero digniùs." (Cicero, *Off.* i. 42.) And yet we are constantly hearing it said that agriculture is yet in its infancy, and that of all the sciences it is the least advanced. As M. Saint-Hilaire has eloquently observed: "On more than one point we may still take lessons from Varro and Columella. In face of the natural philosophy and chemistry of the nineteenth century, we still find, in great measure, the agriculture of the eighteenth, in progress no doubt; to deny it would be ingratitude and injustice; but only in progress, whereas elsewhere there has been a radical change—a complete revolution. Agriculture (in regard to the other sciences) has been in the same relation as are the people of the Arctic regions to other men; not motionless—nothing is so—but moving with such comparative slowness, that in like periods of time they do not move with the tenth or twentieth of the velocity of people in other regions." *

In our previous articles we have dwelt upon this remarkable feature in our national economy. Our trade and commerce, as well as the arts and sciences, have advanced with a rapidity unparalleled in the history of the world; but the proportion of the people engaged in agriculture is sensibly diminishing. The proportion of the land to each inhabitant of Great Britain has fallen from 5 to 2 acres within the last fifty years.† In every county in Scotland there are rural parishes exhibiting a decrease of population; and of the 981 parishes and parts of parishes into which the last census divides Scotland, 479 had a smaller population in 1851 than at some former period of this century. Some of the most fertile of the lowland counties, such as Haddington, Berwick, and Roxburgh, exhibit a decrease in more than half of their parishes; while in the Carse of Gowrie, reputed the most fertile portion of

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* *Lettres sur les Substances alimentaires,* p. 89.
† See last Decennial Report of Census Commissioners.

the Scottish soil, there is a decrease in every parish! Being satisfied, long before we perused the article in the last number of the *Edinburgh Review*, that the alleged depopulation of the Highlands was a fiction, and that the realisation of Professor Blackie's* poetical aspirations for "the restoration of the former prosperity of the Highlands," is a consummation most devoutly to be deprecated, we are by no means disposed to wax sentimental in regard to an evil which has no existence. The *Edinburgh Review*, repeating the plain story told by the very unpoetical, yet most veracious census, demonstrates that in the counties said to be depopulated there are at this day 50,000 people more than ever existed there before. We should not have been particularly doleful had there been a veritable decrease in the land of the Gael, a very large proportion of it being, in our opinion, better fitted for sheepwalks than for the numerous small holdings with which of old it was superabundantly studded. But our equanimity *is* discomposed by the proved decrease of rural parishioners in more than half of our lowland parishes, very many of them being of highest repute in agricultural excellence. We must protest against the accuracy of the Edinburgh Reviewer when asserting "there has been no lamentation over *this* depopulation, while tears and ink have been copiously poured forth in compassion for the alleged depopulation of districts not one tithe so well fitted to be populated."

In a report to the Synod of Angus and Mearns, and in repeated communications to this Journal, we have pointed out the depopulating influences at work in our rural parishes; we have dwelt upon the impolicy of throwing down cottages, and of abolishing so large a proportion of small holdings, that, unable any longer to gratify their desire to live in the country, or be connected with the possession or cultivation of the soil, our rustics are reluctantly driven into large towns, or to seek the gratification of their most natural desire by emigrating to foreign lands.

How can agriculture be expected to lead the van of the advancing sciences when the proportion of those devoted to it is being rapidly diminished? when the area of cultivated land is being so slowly enlarged? when in the United Kingdom there are lying waste no less than 14,000,000 acres capable of improvement, and more than 15,000,000 acres classed as "unprofitable," but with doubtful propriety, seeing that many of them have been reclaimed? How can we cherish such an expectation, when, both by designed action on the part of the legislature, and by the undesigned influence of our national predilection for commercial pursuits, the landholding class is so limited in number, so encumbered with debt, and so hampered by laws intended for their benefit, that, with the most stable property in their hands, they have greater difficulty in

* *Braemar Ballads;* with Notes.

tting credit, or in parting with their estates, than is experienced the holders of any other species of property? Being persuaded at the stability and glory of empires mainly depend upon the oportion of their citizens interested in the possession or occupa-n of the soil, we cannot but think that a diminution in the antity of alienable land must lead to disastrous results in this untry, and therefore we regard as most politic recent relaxa-ns of the law of entail. Large sections of the country thus pass it of hands no longer fitted to hold them with benefit to them-lves or others; the embarrassed landholder is extricated from his fficulties, and into his place there comes a new proprietor, en-ched by trade or commerce, most probably, but actuated by the iiversally-entertained desire to acquire position and influence by coming the owner of property in land. We agree with those litical economists who argue that, in old settled and fully-peopled untries, where the bulk of the population is necessarily poor and pendent, an aristocracy is indispensable for the support of a free stem of government, and for giving continuity and sequence to tional polity, so that it shall not vary with the passions of an thinking populace. But that privileged order, we also maintain, ust be accessible to all who, by the successful application of nius or industry, have attained to independence. No artificial pports of law should bolster up the position of the landowner, poverished by misfortune, folly, and prodigality; neither should e law throw obstacles in the way of another coming into his om, and competent for the performance of duties which he can longer fulfil. It is only thus that there can be a realisation of ose national benefits which we anticipate from the possession of operty in land by a larger proportion of the people.

Our last article on this subject concluded with a lamentation on e absurdly complex and notoriously detrimental state of the law regard to land, and with a promise to make our readers quainted with the very important alterations suggested in the Report of the Commissioners appointed to consider the subject the Registration of Titles in reference to the Sale and Transfer Land."

Being curious to know how this Report, and certain doings con-cted with it, are viewed by the legal profession, we have sought formation from *The Law Times, the Journal of the Law and the wyers.* After perusing the lucubrations of a journal bearing so posing a title, we should, we presume, relinquish with becoming mility our meditated attempt to make the public acquainted with e projects of certain law reformers—"revolutionists," as *The Law mes* insists they should be called. Jurisprudence having been fined "the collective reason of ages, combining the principles of ginal justice with the infinite variety of human concerns," we, our simplicity, imagined that law reform was very properly one

of the subjects submitted to the consideration of one of the sec of the Social Science Association which recently met in Birı ham. And we also—very naturally, we think—were of opinioı this section found an appropriate chairman in a legislator so ‹ rienced as Lord John Russell. But we were quite in a mista seems. Nobody but lawyers must venture to broach law re: Lord John Russell commanding the Channel fleet would, acc to *The Law Times*, have been more in his element than h when presiding over the law-reform section of the Associati the Promotion of Social Science. "To be candid, we mu that we consider civilians to be extremely incompetent refc of the law. What would be said of a medical association p a lawyer or a lord in the chair of a meeting held to conside1 improvements are wanting in medical science?" What s nonsense may be elaborated under a lawyer's wig! The Science Association is not, like "a medical association," m considering a particular branch of human knowledge, and oi ing only the opinions of those by whom it is specially culti\ it is the collective reason and experience of our nation, assc together for the purpose of discussing whatever affects socia being, and taking for its motto "*Homo sum, nihil humani a a me puto.*" To think that such an Association, or that *The J of Agriculture*, shall not discuss topics of such general inte the laws regarding land, but reverently leave them to the la is folly so sublime in its absurdity that we can only accoun by supposing that it comes from one whose pedigree is trace those who so pestered Job that "he answered and said, No *ye* are the men, and wisdom shall die with *you!*"

However shocking it may sound in lawyers' ears, we mı press the opinion that, in the conviction of educated men, it i time that the laws affecting land should be reformed, conc and simplified, so that there shall be increased facilities for c and occupying, for alienating and leasing, and for borrowir lending the capital necessary for profitably cultivating this of property.

To those acquainted with their own language, and accu to write with precision, it is an intolerable nuisance to di when parting with or acquiring property in land or houses owing to their inability to comprehend legal phraseology, tl helplessly at the mercy of the person drawing up the ne deeds. How can it be otherwise, when it is still, though le quently than before, one of the conveyancer's duties to p instruments in Latin, and render the contents of deeds in tongue; and when in our land rights there is much which be comprehended until the light of bygone centuries shines u "In order to understand the conveyance of the nineteenth c we must revert to the opinions and usages, the authoriti

ictice, which prevailed between the thirteenth and sixteenth. r has the necessity of this research been removed by recent tutes, which have much abbreviated our land rights, but have t them the same in effect, and still regulated by the same feudal nciples." * Had these principles been applicable to the general cumstances of the human race, their perpetuation would have n desirable. But in what did they originate? The feudal sysn, in its mature form, was the result of the confusion and changes ich followed the overthrow of the Roman Empire, when its laws re modified and altered by those prevailing among the warlike barians who effected its ruin. Its grand feature was, that it ested the sovereign with the character of original and supreme prietor of all land subject to his dominion. By him territories re allotted to his more powerful subjects, who subdivided them ong their dependants, and these, in their turn, made subordinate nts, which descended through successive grades to an extent nmensurate with the exigencies of the military following down its lowest rank. The property thus distributed was held upon ious conditions, of which the fundamental one was fidelity, untaken by the act of homage. "Such," observes Professor Mens, "was the feudal system in its most prominent features. *As a itical institution, it will not bear to be examined by modern tests ideas.*" And yet we have the authority of the learned Professor asserting that our land rights are still regulated by the feudal nciples! That England of the eleventh century, prostrate under heel of the Norman Conqueror, should be ruled by such prinles was an inevitable evil; but why should the industrialism of peaceful days be cramped by bonds forged by barbarian solrs, and forced upon our country by a successful invader? It is n to expect that a nation which has reformed its ecclesiastical, legislative, its municipal institutions, shall long submit to such incubus upon industry. From various quarters we observe most nificant note of preparation for a vigorous assault on the strongd of the lawyers; and our confidence that the admirers of meval forms shall be signally routed is heightened by perceiving most among the assailants jurisconsults so learned as Lord ougham and Sir Fitzroy Kelly, landlords like Mr Vincent Scully, l practical agriculturists like Mr Mechi. Ten years ago we find Lindley writing thus in *The Gardeners' Chronicle and Agricul-al Gazette*: "Correspondents holding widely different opinions, l starting with most opposite data, argue for the same conclu-ı. 'If we are to have free trade in corn,' says one, 'we must e free trade in everything else. Free trade in corn will even-

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* *Conveyancing according to the Law of Scotland*, by the late Professor ALLAN ZIES, p. 13.

tually necessitate free trade in land.' 'Great principles,' says another, 'cannot be carried out by halves. Feudal relations must follow the fate of commercial restrictions.' Amongst all these multiform deductions, that which had taken the name of 'Free Trade in Land' has found the most varied, and hitherto disconnected advocates. The lawyer, the landlord, the capitalist, the public economist, the commercialist, and last, not least, the tenant-occupier, have each assigned their several and respective reasons for an inquiry into the policy of that remnant of feudal wisdom which throws its protecting arms, with the unwholesome shadow of the upas-tree, over the exchangeable and productive value of the broad acres of England."

Loudest in the attack on this doomed remnant of "the good old times," we hear the diurnal and hebdomadal growlings of the public press. "From time immemorial," observes a leading member of the Fourth Estate, "every inch of land within this country has been in bondage to the lawyers. It is time it should be emancipated. There is no necessary connection between squires and sheepskins. Sales and mortgages of land, whatever the family lawyer may say to the contrary, can conveniently take place without abstracts of titles and deeds of indenture. Let the dubious landowning mind just hear that eminent, recondite, and most conservative lawyer, Sir Fitzroy Kelly, on this point. Sir Fitzroy, speaking in section (of Social Science Association), and not in committee, with no party bias, with no fear of the country gentry or the family lawyer before his eyes, declared himself explicitly and positively for a Registration of Titles—in other words, for a mode of conveyance which should make the transfer of land as cheap and simple as the transfer of stock. 'There is no difficulty about it,' said the great lawyer. 'There must be a parliamentary title, there must be an Encumbered Estates Court, with the same machinery that has worked such wonders in Ireland. In two or three years an indefeasible title might be thus obtained for all the land in England; and any person in whose name land was registered, would be able to transfer it as stock is transferred in the Bank of England.' " *

And, lastly, the ponderous artillery of the *Edinburgh Review* booms forth approbation of "a sound system of landed credit," and declares that "the class of persons who have hitherto successfully resisted all attempts to introduce this system, is precisely that class which would eventually be most benefited by its adoption."

Whence this harmony? We ascribe it to the widespread and growing conviction that the present state of the law in regard to land is intolerable. Let us describe some of the

* *Daily News*, 16th October 1857.

evils for which the Report on Registration of Titles proposes a remedy.

We have already alluded to the disgust experienced by educated men upon being presented with important documents which they must subscribe, although to comprehend them exceeds their laborious attention. The Report of the Registration Commissioners furnishes an illustrative case of too common occurrence. In the Appendix, p. 410, we have a communication from Mr William Booth, C.B. (Ordnance Office, Dublin), who informs us that he has been nearly fifty years in the public service, and that he was led to take particular interest in matters connected with the tenure and transfer of land in Ireland and Spain, "the great Duke of Wellington having intrusted him with some affairs connected with land" in the latter country. This gentleman, who has seen the world, "having served in several countries," "hopes to be permitted to state the following for the information of the Register of Title Commissioners." "In the month of June last, a small interest in land was put up for sale in one of the Master's offices of the Court of Chancery in Ireland. As the land adjoins a farm belonging to me, I was reluctantly led to buy it, having very natural objections against any dealings for property passing through the Court of Chancery. However, it was knocked down to me as the highest bidder for £325. My attorney is an active man, and considered moderate in his charges. With all his activity, it required eight months to obtain the title, which is said to be very short and simple. His bill of costs for this service amounted to £55, 10s. 5d., being more than 17 per cent on the purchase-money. He has furnished me with the papers and parchments relative to the title, which I have caused to be accurately weighed. They weigh exactly 22 lb. 2½ oz. They fill a box 1 foot 11 inches long, 1 foot 4 inches deep, and 1 foot 4 inches in breadth; and I think there is as much writing in them as would occupy about three months' hard reading, if any person would attempt such a task. Though I am the purchaser of that land, and most interested in those papers, they are as unintelligible to me as if they were written in the Chinese language. Can such a system of transferring land be continued in a country like this in the present state of society?"

We are really much obliged to Mr Booth for his striking illustration of the beauties and benefits of conveyancing in the nineteenth century. "*Opinions*," quoth the old saying, "are not to be numbered, but *weighed;*" but for the application of this maxim to lawyers' *deeds*, we thank the facetious old campaigner, Mr William Booth, C.B. More than twenty-two pounds' weight of documents, unintelligible as Chinese, and costing more than fifty-five shillings per pound, exclusive, in all probability, of the price of the box! We defy *The Law Times* to uphold such a traffic. It will infallibly be put down amid "roars of inextinguishable laugh-

ter." Thanks to the whimsical minuteness with which Mr Booth has chronicled the details of his investment!

We have another statement of the expense of transferring property in land, of greater authority, if not so amusing: "An account of a purchaser's legal expenses, incurred at various times and in different parts of the country, has been furnished by one of the witnesses. It gives an average of two and a half per cent on the purchase-money, or five times the *ad valorem* stamp-duty. But as an average affords no notion of the heavy burden in individual cases, it is necessary to look at the smaller properties. It will then be found that the expenses of the purchase-money mount up to ten, twenty, and even twenty-three per cent."* So, then, the purchaser of half-a-dozen acres of land may be saddled with legal expenses amounting to twenty-three per cent on the purchase, whereas the same person might, in a single day, have bought half-a-million of funded property without any legal charge or government tax, on the mere payment of half-a-crown per cent for brokerage. We all know that there is a difference between movable property and property in land: a bullock differs essentially from the land on which it is reared; but why we can speedily, and by a perfectly safe and intelligible transaction, part with or buy the one, but can neither alienate nor acquire the other, save by a process slow, expensive, hard to be understood, and full of jeopardy, a man of unsophisticated mind cannot comprehend. "If," observes the Report of the Registration Commissioners (p. 24), "there had been always a register of land, as there is in fact a register of ships, of stock in the Funds, and of railway shares, it would be difficult to point out any substantial distinction between property of that description and land, so far as regards the modes and forms in which they might respectively be transferred or sold. The distinction between them has arisen, not so much from the different natures of the things themselves as from the different regulations to which they have been subjected in their origin, and in the development of their legal qualities. The right to the one has grown up under the feudal system of law, adapted, no doubt, as far as it could be done by judicial decision, to the varying wants of mankind, but without the aid of a controlling power to simplify its tenure or facilitate its disposition. The right to the other has been created and regulated by Parliament itself, which, having to deal with a new subject, determined at once to allow no trusts to affect the transfer of it, and therefore excluded from the register of the right to it all modifications which might otherwise qualify the absolute ownership. Had land always been similarly registered and similarly transferred, no one would now think of imposing on its present proprietors the harsh and unnecessary burden of fur-

* *Registration Commissioners' Report*, p. 11.

nishing, before he could part with a single acre, a detailed history of every transaction relating to the property for a period of sixty years, nor of forcing him, before he could borrow £100 for the purposes of improvement, to prove every birth, marriage, death, settlement, charge, conveyance, or encumbrance, that might by possibility affect the title, for more than half a century past; and if this be so, how much more beyond reason would it be to compel an owner, after such a process had been gone through on his purchase, again to undergo it, when he might wish to sell that to which the title had been both recently and abundantly proved?"

All this is very bad, and yet we have not heard the worst. These interminable inquiries into the deeds and misdeeds of defunct personages might be endured, if the result were the completion of a title absolutely unexceptionable. But owing to the want of a register, a title is at best inferential and negative: "The title can never be affirmatively and positively shown to be good. The possibility of its being impeachable cannot be excluded." Besides this, to a landowner, most alarming statement, the Commissioners quote with approbation what is said in the Second Report of the Real Property Commissioners: "We believe it may be confidently asserted, that of the real property of England a very considerable portion is in one of these two predicaments—either the want of security against the existence of latent deeds renders actually unsafe a title which is yet marketable; or the want of means of procuring the formal requisites of title renders unmarketable a title which is substantially safe."

The lands with unsafe titles may, it appears, be safe to hold, safe to enjoy, safe to live upon, safe to the owner to eat and drink the produce thereof, which is a great comfort, no doubt, to a law-fearing laird; but then to part with them may be impracticable! The mere suspicion of a flaw in the title may effectually repel every purchaser, however desirous to acquire them. Well has it been asked, "Why is our common sense to be affronted by being told that a title is good to hold, but not a good title to transfer? What do we want of land except to hold it safely? Why are the sellers of land to be mystified and perplexed with all this fantastical jargon of marketable title and holding title? We are told by some that the system cannot be touched or altered, or hardly inquired into, without danger to titles throughout the whole of the country. What advantage has this system? Is it cheap? Is it certain? Is it speedy? Is it safe? The only reason for inquiring into title at all is the security of purchasers. This seems to be invented to insure their plague and peril." *

* Lectures on the Transfer of Real Property, and the Legal Difficulties which obstruct its Sale, by James Stewart, Esq., at the Rooms of the Society for the Amendment of the Law. London, 1848.

Difficult as is the mode of acquiring or parting with land; serious as is the expense of the transaction, and annoyingly uncertain as is the result, we have only indicated a few of the present imperfections of the law. The Registration Commissioners specify no less than twenty-one sources of danger and annoyance to intending purchasers of land. In mercy to our readers we spare them the perusal of this doleful list, demonstrating how "many be the sorrows that environ," not "the man who meddles with cold iron" but the man who has to do with land and lawyers; sorrows which, since the days of Hudibras, have multiplied so frightfully, that the public feeling as to the legal impediments on the transfer and sale of land, has no doubt been faithfully expressed in a recent pamphlet by the Right Hon. T. B. Cusack Smith (Master of the Rolls, Ireland), and still more forcibly and briefly in the *Times*, 29th March 1852: "The system which has been suffered to grow up in this country is one which might have been devised expressly to render land as little an article of commerce, as little vendible and purchasable, as possible. If a man has a certain sum of money which he wishes to exchange for shares or stock in a public company, or the Funds, the law points out an ostensible owner with whom he may deal; and though the stock or Funds be affected *with any amount of trusts*, the writing of a few words settles the transaction. But if a man wishes to exchange his money against land, he is at once involved in a labyrinth of difficulty and expense. Voluminous abstracts, innumerable queries and objections, interminable conveyances, wearisome delays, and still more interminable attorney's bills, beset his path, and, unless the purchase be very large, bear a formidable ratio to the outlay."

But the landholder is a sufferer from the state of the law in another important respect, to which we have not yet alluded: he has much greater difficulty in effecting a loan upon the security of his undeniably valuable property than is experienced by a man who can offer no guarantee save his stock in trade, or his commercial reputation: a man whose credit is good will very often meet with speedy pecuniary accommodation, while the owner of half a county, offering the security of his land, shall have to wait, and encounter the most vexatious difficulties. His credit is landlocked, involved in that species of property round which the law has thrown its trammels; his own character for common sense and integrity, coupled with the possession of valuable property, are not sufficient to secure for him the obsequious attentions of the money-lender. He must give security over his land, and effect a mortgage; a [illegible]y process, and too often a ruinous; for burdens upon land gene[illegible]y increase with a fatal facility, so that the unhappy borrower, [illegible]rievable embarrassment, flounders on year after year with [illegible]p of hi[illegible] aw-agen[illegible] the fabric of his fortunes yields to [illegible] of the [illegible] hammer!

His private disaster is a continuous public injury; from the ay he called the property his own till it passed to another, he has een hampered in its enjoyment and impeded in his usefulness from 'ant of the necessary capital to develop its resources. Hence elds undrained, cottages too few or dilapidated, and tenants disatisfied, because not receiving the encouragement which their truggling landlord is in truth unable to afford.

We had, then, abundant reason for concluding our last article rith a lamentation over the state of the law in regard to property ı land; we think it will not be denied that it is alike injurious to ıe few who own it, and to the many who wish to become possesɔrs of what, sometimes with very apocryphal propriety, is termed real property." How little *real* possession of the land is there y its nominal owners, if there be truth in the calculation, often ıade, that the landed property of England is burdened by debts nd encumbrances to the extent of fifty, that of Scotland to the xtent of sixty, and that of Ireland to the extent of seventy per ent! Surely when, in a recent debate, the House of Lords disussed various proposed measures for facilitating transfer of land, ındholders, bound hand and foot by mortgages, charges, judgıents, settlements, and all sorts of legal complications, had little eason to be thankful when a learned lord opposed these measures, for," said he, "if a man wants to raise money on his property, he an mortgage!" What should we think of a surgeon saying to . patient seeking to arrest an eating cancer in one eye—"Oh! ıever mind—let it eat into the other also?"

His lordship admitted that the law of real property and the loctrines of conveyancers are full of absurdities, but is altogether ›pposed to the proposals of the Registration of Title Commissioners. ' I hope," exclaimed the learned lord, "I shall never see such acility for the transfer of property. If a man could carry his titleleeds in his cigar-case, no one would answer for the consequences." Will the public prefer Mr Booth's big box, with its more than wenty-two pounds' weight of unintelligible documents? We think ıot! As for the consequences of property being transferred by a egal document so brief as to be portable in a gentleman's pocket›ook, we have a host of witnesses averring that the immediate 'esult of such an easy transfer could be to add to the value of land o the amount of two or three years' purchase.

With such a contingency in prospect, landholders may wait with quanimity for the introduction of these alterations in the law vhich, to certain minds, are inconceivably terrible.

We shall give them the opportunity of judging for themselves ›y explaining the proposals of the Commissioners on the Registraion of Titles with reference to the sale and transfer of land.

They first discuss the possibility of creating a general "regisration of assurances"—that is, of all deeds and transactions affect-

ing land—and arrive at the conclusion that such a system is impracticable. Our readers may well believe this, when informed that one of the most prominent objections to registration of assurances is the vast bulk and increasing quantity of deeds and instruments which would have to be kept, and on transfers to be searched and examined; and that solicitors calculate that these instruments would accumulate at the rate of 300,000 annually, and require a registry of about a thousand a-day for every working day. A conveyancer's paradise this! but a public purgatory; for not being landed in which let us be thankful. The Commissioners announce that the objects in view are, to form a register of title, as distinguished from the various deeds and assurances under which the title has been derived; to form this register in such a manner that the retrospective inquiry into the former dealings and transactions, which on a transfer is now necessary, may be avoided; to make this register instrumental in simplifying generally the title to land and the forms of conveyance; and at the same time to continue, as far as possible consistently with a simple register of title, the existing system of settlements, and to avoid impairing unduly the security of settlements and trusts. They are of opinion that the register ought to be composed of a succession of simple transfers merely, and should manifest only the actual and existing ownership of the land for the time being, without laying open the history or past deduction of it. Now, with or without leave of *The Law Times*, we are sure the public long for this "revolution." What does it matter, to an intending purchaser of land, who had it fifty years ago? He only wants to know whose it is to-day, and how it may be his own to-morrow; and if the law had not stepped in between the buyer and seller of this species of property, to transfer it would have been as easy as the completion of any other commercial transaction. The public interest only requires that there shall be an authentic record of the sale. This simplicity actually appears offensive to the dignity of certain proprietors of land; and in answer to the proposal of a simple-minded *parvenu*, to pay down on the spot many thousand pounds of purchase-money, we have heard of a gentleman exclaiming, "Confound the fellow! he buys my estate as if it were a pound of butter."

The Commissioners, not without some difference of opinion, conclude that registration shall not, at least in the first instance, be compulsory. This is to be regretted; for surely they have reason on their side who argue, that a main benefit of the system will be lost, if the register be not the sole and conclusive evidence regarding the proprietorship of land. They also decide against a parliamentary [illegible] similar to that conferred by the Encumbered Estates Court [illegible] Ireland. However desirable it may be to inter- [illegible] Parliament in creating an indefeasible title, [illegible] apply to the whole country the system so

ssfully introduced into Ireland through the medium of this . It has proved an incalculable boon to that unhappy ry; and yet, after all, it is but a bungling piece of legisla- There is no provision for perpetuating and continuing, as ture transactions, the parliamentary title obtained upon a ase from that court. The title is unimpeachable as to all actions prior to the time of the purchase, but immediately the purchase, the transfer of the land becomes subject to the al law; and as to all transactions taking place after the ase, the title is liable to become again involved in complica- and embarrassments similar to those from which it was ed by the sale under the Encumbered Estates Act. Per- nt simplification of title, and simplicity of transfer, are not ed by the Act, and retrospective investigation of the title nes again necessary, though at present not to the same t as formerly. Truly do the Commissioners term this "a rkable circumstance." We have specially noted it, in order t may attract the attention of those interested in Irish pro- . It puts, so far as we are aware, a heretofore unsuspected, ve believe, a strictly correct, interpretation upon an Act of ment, the effect of which is most beneficial, and most ving of perpetuation and wider application.

e next question considered by the Commissioners is, whether sts existing in land, before the time of the first registration e land, shall be in any manner affected by the operation of egister. With some difference of opinion, however, they de that such interests shall not be adversely bound or ed by the mere registration as such, but should be allowed to imed within the period now fixed by the Statutes of Limi- .

ey then proceed to consider whether registration of the legal ship will be compatible with due protection of the equitable neficial interests in land. Any material interference with ture of such trusts would, it is admitted, be objectionable; nder modified forms, the Commissioners are of opinion that stem may be continued, consistently with the objects con- ated by the registration of title. After showing how this be effected, they observe: "Thus the existing system of nents, by which the limitations and trusts of the settlement y and become part of the title, will be unchanged under a ry of title so long as the land continues in the possession of ttler, or volunteers claiming under him, or the trustees of ttlement. Upon a sale without fraud, these limitations and will attach to the funds arising from the sale." In regard dangers apprehended from abuse of power by trustees, it is : "It should not be forgotten that there are millions of r in the Funds, and in railways, canals, docks, and other

undertakings, left to a great extent in the names of trustees, and yet it has been found that property so situated is practically safe. Can it be believed that what is safe for beneficial interests in such property, when prudently looked after, will be otherwise than safe when applied to land, especially if there be thrown over it those additional protections which we recommend in this Report?"

The mode of carrying into effect the proposals of the Commissioners is a land register and transfer office for England and Wales, to be established in London, under the management of a Registrar-general, and in connection with branch offices throughout the kingdom. The proposed registration is of two kinds; one which shall at once enable the registered owner to transfer the estate, with a present or immediate statutory title; the other, registration of actual ownership, without the power to transfer an immediate statutory title. Stringent provisions are indicated for the prevention of improper attempts at registration. The great novelty contemplated is registration with immediate statutory title, which, for the future, will be manifested by the register alone, and which, with regard to the past, cannot be disturbed. This is to be effected by the registrar causing the title to be fully investigated, at the expense of the parties, by counsel and solicitors; and should their opinion be favourable, he will, on payment of a small per-centage on the estimated value of the property, register the ownership as a warranted one, either in name of the party applying, or of others nominated by him. Since the guarantee will be given by a public officer, the premiums paid by those obtaining the guarantee will be paid into the Exchequer; and the Consolidated Fund will be liable to make reasonable compensation to any person who may, within the period allowed by law, establish a claim in respect of the estate, the title to which has been thus registered with a warranted ownership. As a precedent in favour of the suggested warranty, we are reminded that when lands are sold by the principal officers of the Ordnance department, Parliament has empowered them to give to purchasers an indefeasible title, and to compensate those who, within a limited period, can establish a legal or equitable right to the property.

The Law Times is very facetious on the iniquity which may be perpetrated on an unsuspecting proprietor of land, by a collusive conveyance of the fee, or a sham conveyance prepared by a tenant [illegible] the real owner, it is argued, "may never have gone [illegible] that the property was his [illegible] grandfather's [illegible] has got his sheepskins at [illegible] He thought it [illegible], *presto!* comes the pur[illegible] the parchments of a century [illegible]y. Well, villany is ingenious [illegible] sudden [illegible] case supposed is a little too gross [illegible] really [illegible] occurrence we suggest, might be

ed next to impossible by the simple enactment that each ›ted registration of ownership shall not only be published, ·mally intimated to the last-registered owner or his repre- .ves.

to the danger of an improper transfer of property, and com- ion to the person ousted from his possession, it is presumed ıe zeal of public officials, aided by the intelligence of counsel ·licitors, would sufficiently guard against it. Compensation h a case would often be a miserable *solatium;* for how can ;ash comfort a man's heart for the loss of the home of his ood, and of fair parks and venerable woods handed down he olden time?

›se sentimental and purely contingent miseries will not, how- ɔutweigh the solid public advantages to be derived from the ›als on which we are commenting. In order that our readers ›e able to judge as to the nature of these advantages, we :lassify them under the following particulars:—

Retrospective investigation of the title will be unnecessary as dealings in land subsequent to the commencement of the :ation, and will gradually operate to dispense with such in- ation altogether.

Simplification of the title to real property, and, where war- is obtained, a parliamentary title as against interests existing to the registry, and this though there be no concurrent im- nents in the general law of real property.

Purchasers of fees and leases will be perfectly secure.

The forms of transfer and the modes of conveyance will be y simplified.

The saleable value of land will be increased by removing lties, and enabling the purchaser of land to determine accu- his expenses.

It will tend to lower the rate of interest on loans secured on ınd remove the reluctance of bankers, the natural traders in to lend on mortgage or judgment.

t will facilitate the sale of large estates in lots, as has already ·xperienced in Ireland; and all purchasers of land in small ıs will acquire it with the facility which has rendered so .r the "Freehold Land Societies," of which in England there ısiderably above a hundred.* One of these, "The National," ›ued 87,920 shares, and purchased more than a hundred estates. The price of the allotments vary from L.50 to *ıcluding the expense of conveyance.* This is a practical com- ry upon our reiterated assertions as to the general desire for nd of property. What a contrast is this facility, combined ɔonomy, to the cumbrous and expensive conveyancing usually

* *Building Societies Directory and Almanac.*

employed! In Mr Sweet's table of legal expenses attending
chases of land in various parts of the country, we notice one
in which the purchase-money was L.100, while the legal exp
were L.23, 14s. 3d. Unless through the instrumentality of F
hold Land Societies, it is evident that the great majority of
people in the United Kingdom never dream of becoming pro
tors of land, or of investing their savings in loans upon land.
want of small properties, and the cumbrous and costly mod
legally acquiring an interest in them, when available, effect
repel them—to their own great disappointment, and to the grie
injury of the community also, we are persuaded. No more
servative plan can be devised than to seek to impart stabili
our institutions, by giving an interest in the possession of the
to a considerable proportion of the people. More than a hun
years ago Lord Hardwicke asked, "What is the great incite
to industry and merit in trade, study, or the profession of a
Founding families. If cut off from all opportunities of real
—that is, acquiring real property—they are scarce incorporated
the body of the people." If this be true, our national syste
property does not rest upon a sufficiently wide foundation. "
notorious that the owners of land have been decreasing, and
now comparatively few. I have heard them estimated at 80,(
observes Mr Stewart in his Lectures before the Society fo
Amendment of the Law.

We hail, therefore, the labours of the Registration Commissi
as a move in the right direction. From a desire only to deal
matters submitted to their consideration, they did not con
themselves called upon to report as to the expediency of the
tem of land-credit common in many parts of the Continent
zealously advocated by one of their number, Mr Vincent Sc
M.P. While signing the Report, because harmonising wit
views so far as it goes, that gentleman guards against misco
tion by a memorandum attached to the Report, and treati
very important matters. "One of the chief objections us
felt to the investment of money in the purchase of land is,
capital so invested becomes permanently locked up, an
available usefulness thereby much diminished. This objec
observes Mr Scully, "would be obviated, and the value of all
[illegible] greatly increased, if he could use it at any ti
[illegible] ..lating medium, by possessing a limited pow
[illegible] ferable land debentures. He might the
[illegible] without expense or delay, raise sums of m
to pay [illegible] portions to his children, to impro
stock [illegible] his current engagements. By cor
ng pro[illegible] land into land debentures of equivalent
[illegible] able as personal property. The d
[illegible] which they represent might be pu

settlement, and there would no longer exist the necessity for having intricate settlements of land. The land would be represented by these transferable debentures, and in lieu of a complicated system of acts, deeds, and encumbrances of various sorts, there would thenceforth be substituted the most simple forms of charge and transfer. The proposed land debenture would possess more advantages than now belong to the best mercantile bill of exchange, or of the most secure mortgage. It would combine the negotiability of the one with the stability of the other. These debentures would be eagerly sought after by bankers and capitalists as secure investments for their unemployed funds. The only expenses would be some trifling office-charges, and some small stamp-duties, which, from their frequency, would produce a large income to the State. This species of revenue would resemble the Post-office charges. It would be another description of public taxation cheerfully paid for value received."

Mr Scully suggests that the vast and convenient revenues derivable from dealings in land and in land debentures, would soon enable Government to dispense with the oppressive duty recently imposed upon all successions to land. Mr Stewart, in his evidence before Mr Slaney's "Savings Committee," affirms that in Hamburg and Frankfort bankers prefer land debentures to bills or bonds, and that the Government benefits largely from the constant dealings with land—the stamp-duty raised in that manner as revenue being much larger than is raised in this country. It is much to be desired that the Chancellor of the Exchequer should turn his attention to this apparently very feasible method of raising "the ways and means," the dexterous imposition of which, so as to please and benefit as many as possible, is his chief annual political exploit. Should he patronise it, landowners should rejoice; for, besides the benefits to them already specified, land debentures would enable them to pay off encumbrances at their convenience, and in driblets;—a great boon, undoubtedly, for under the present system the history of any large encumbrance has a notorious resemblance to a snowball. Some foolish or unlucky squire begins the encumbrance—his successors roll it with visible additions on their posterity; and at last the whole estate rolls into Chancery, where it usually melts away. Certainly, to take from the shoulders of an encumbered proprietor the dead-weight of utter helplessness is the most likely way to stimulate his exertions to throw off the burden. A man who shrinks from attempting to pay off at once a mortgage of L.10,000 may very possibly have virtue enough to get rid of his burden piecemeal, by ten annual payments of L.1000; and so much private happiness and public usefulness is implicated in this matter of debt paying, that the laggard virtue of embarrassed landowners should be encouraged by every prudent device. When such facilities of burdening land,

as well as relieving it of debt, are within the reach of our lande proprietors, it will no longer be as true as it was in Shakespeare' days, that "borrowing dulls the edge of husbandry;" and whe transactions in land become simple and inexpensive, it can hardl be questioned that its owners will be emboldened to expend on i improvement with a liberality at present rarely witnessed. Ir stead of indulging the folly of buying more land with insufficie means, they will rather borrow for the purpose of bringing wh they possess into the highest state of productiveness. The mone necessary to buy two acres will drain and deepen four; and t quantity of land the value of which might thus be doubled, mu be enormous. So that for hundreds of years to come there enough of imperfectly cultivated land to give remunerating emplo ment to labourers, if only those who possess it were in a positi to develop its capabilities.

Of course, it would never do to encourage the imposition land of unlimited liabilities under the pretext of improving It is proposed, therefore, that the land debentures shall be limit in amount, both with a view to impart to them an immedia marketable currency, and consequent increase of value, and al to avoid those unlimited charges on land which have been disastrous in France, where the land, in 1849, was mortgaged about 560 millions sterling.* In the Transfer of Land Bill, draw up by Mr Scully as an improvement on that proposed by t Registration of Title Commission, it is therefore suggested th the total amount of land debentures shall be limited to *ten* tim the annual value of the land. Thus, if a person has an esta valued at £1000 a-year by the Land Tribunal (a new institutic also advocated by Mr Scully), he may apply to the judges to iss on its credit £10,000 of land debentures, of £100 each, or a other uniform sum, all being of equal priority, and bearing equal rate of interest, which should of course be the mark interest of the day. The principle of adopting a public valuati as a sufficiently safe standard of value, has been already tested the past experience of other states. In Poland, land debentu have been profitably issued by a public "Land Bank," to t extent of *three-fifths* of the registered valuations of encumbe estates.† The amount issued from 1824 to 1852 is stated at millions sterling—the realised profit being £800,000. The Dan Government advanced *two-thirds* of the value of large tracts of la to the occupying tenants, to enable them to purchase the own ship of their holdings. In Hamburg and in Frankfort money lent up to *one-half* of the value, upon a title of guarantee by t State. In France, also, money is advanced up to *one-half* of t

* RAUDOT—*Decadence de la France.*

† JACOB's *Tour of Poland,* 1826. *Morning Chronicle,* 30th October 1851.

ıe, by a company of capitalists authorised by the State to rantee the title, and to issue negotiable land debentures of 0 francs each.

a this country, as well as in the colonies, the debenture prin- ɜ is largely acted on, and by its means the public willingly ıst large sums upon the security of property held by corpora- s and companies. Being thus familiar with municipal, rail- ',-water, harbour, and road bonds or debentures, it certainly ɪtonishing that landowners have not insisted upon the applica- of the principle to their property. It is argued—justly, we k—that there can be no good reason for confining to a com- y* of private speculators the monopoly of charging land with ısferable debentures, and that every landowner should enjoy privilege in a form beneficial to himself and the public. Pos- y from recent experience of the benefit to Ireland of the change he law regarding land, the Irish mind is more receptive of new s than are the inhabitants of other parts of the United King- ı. Certain it is, that while the Registration Commissioners, several of those examined by them, look coldly on the pro- ɜd issue of land debentures, it is very favourably regarded Sir Robert Kane, Mr W. P. Urquhart, M.P., Dr Hancock, and ıy other gentlemen well known in Ireland. Several of them are that they are acquainted with the Prussian system—on ch that of Mr Vincent Scully is founded—and that they erly desire its introduction. As there is no reason for suppos- that this system cannot be advantageously introduced into this ıtry, we hope to stimulate landowners to investigate its merits ɔriefly describing it, as well as enumerating some of the bene- it is said to have conferred on Prussia. The Prussian land ɜntures are issued by companies of landowners, whose united ɔerty constitutes the security for the money borrowed. The nbers of the company have the privilege of borrowing from it he amount, generally, of one-half the value of their individual tes, and are charged a moderate commission, and interest suffi- t to reimburse the cost of management. The company grant hose who intrust their capital to it letters of security (*Pfand- fe*) or bonds over its property, signed in its name, and bear- interest. From its members borrowing from it, there is cted signature of a contract binding them to repay in fixed ıs within a specified number of years. The landowner thus uires the use of ready money in proportion to the value of his te, and is aware of the time when alone it can be recalled. As debentures given to the capitalist in return for his loan are ıred by the united properties of the members of the companies, y are not looked upon as private loans. They readily circulate

* Land Improvement Company's Act, 16 and 17 Vict., c. 154.

like paper money; and thus the most unfavourably situated districts get the benefit of employing capital, while the capitalists have an undeniable and readily-convertible security.* As this system is free of the lottery, which forms such an impolitic adjunct to the *Credit Foncier* scheme countenanced by the government of France, it is not surprising that the knowledge of its utility in Prussia, during the greater part of a century, should have excited a desire for its introduction into this country also.

It is doubtful whether, even in these days of reckless trading and artificial credit, with quinquennial or septennial crises and collapses of so-called "great houses," people will be induced in greater numbers to strengthen the main foundation of the empire by helping to develop that "free trade in land," which, according to some, is "the true wealth of nations." It may also be problematical whether we shall speedily experience the benefit of the land-debenture system. It is undeniable, however, that the conviction is growing that there must be a thorough revisal of the laws regarding the sale and transfer of land. The Right Hon. T. B. Cusack Smith, Master of the Rolls, Ireland, truly describes the popular sentiment: "The public desire that they should be enabled by law to sell land as they can sell government or railway stock, without the necessary intervention in every case of judges, commissioners, or lawyers, and without a heavy bill of costs accompanying each transaction." From this we rejoice to infer that the learned gentleman does not share in the aversion to the coming of a time when a man shall be able to carry his title to his property in his cigar-case.

It is vain to wish for a return of those primitive times when bold barons bit the sealing-wax in attestation of their assent to important documents, and a Saxon king subscribed a charter with the figure of the cross, accompanied by the ingenuous confession that he did this on account of his inability to write. But what a contrast is there between such want of learning and that learned folly which is now the characteristic of legal transactions! Surely, in avoiding the pitiful ignorance of ancient times, it is not necessary to maintain the now inappropriate and mostly unintelligible technicalities of feudalism. It is enough that it has bound in its chains the business of the world for so many hundreds of years. We moderns need a jurisprudence of our own. It is difficult to [illegible] the intricate meshes of form and technicality in which the [illegible] property are involved; it is not easy to persuade [illegible] heretofore finding fame and fortune in trying to guide [illegible] these forms, that they will be benefited by the [illegible] a simpler mode of conveyancing, in [illegible] transactions in the sale and transfer

* [illegible] Carl Ludwig Heinrich Rabe.

of land; and it may be a while before proprietors of this kind of property shall reckon it safe, when unguarded by those securities which, in fact, have hampered its use and impaired its value. All this may be; but the publication of this Report on Registration of Title, and of the mass of valuable matter by which it is accompanied, must lead to public discussion, and to the introduction of legislative remedies. At this we shall heartily rejoice, for then shall be removed the main obstacle to the realisation of those benefits which we anticipate from the possession of land as an industrial occupation for the people.

Our anticipations have been realised. Since this article went to press, Her Majesty's Speech has informed Parliament that "measures will be submitted to their consideration for simplifying and amending the laws relating to real property."

THE FARMERS' NOTE-BOOK.—NO. LVIII.

*Skilling on Turnip-Culture.**—The great and continually increasing importance of the turnip, the most valuable of all our root crops, entitles to our careful consideration every method suggested for its improvement, and especially what professes to be an easier and more profitable mode of culture. There is some reason to apprehend that the treatment to which it is now subjected may have the tendency to impair its good qualities; and while it does not diminish the diseases to which it is now liable, may induce others which have not yet, at least to any extent, assailed it. The longer a plant is cultivated, and the more it is forced to a high state of growth by the use of highly stimulating manures—the further, in short, it is removed from its natural state—the more likely is its constitution to become enfeebled, and lay it open to deterioration and disease. The use of strong doses of guano, bone-dust, and suchlike substances, is more likely, we think, to increase the watery ingredients of the turnip, which in all cases exist in very large proportion, than the saccharine and other principles on which its nutritious properties mainly depend. It may often happen, therefore, that a very heavy crop may be somewhat delusive, and its feeding properties by no means proportionate to the bulk it presents to the eye. In Roxburghshire, one of our principal turnip counties, the mysterious finger-and-toe disease, which seemed for some seasons to recede before the use of lime, has of late been gaining strength, and it is obvious that we can no longer look to

* *The Turnip and its Culture.* By THOMAS SKILLING, Esq., Professor of Agriculture, Queen's College, Galway. Dublin, 1857.

that substance as a specific, although it may still act as a palliative. We have noticed, also of late, a peculiar kind of rot, in some instances affecting the bulb while yet comparatively young, under which the whole substance undergoes rapid decomposition.

The announcement of the work mentioned below, led us to hope that some new light might be thrown upon the subject, and useful hints suggested for the mode of treating this invaluable root. We find that it is confined to a mode of cultivation which has been successfully followed in Ireland; but it seems practicable only on a limited scale, and cannot be recommended for general adoption. The culture of the turnip has been all along very much in arrear in that country, especially in districts remote from the capital; and in such places the method here described may be followed with advantage. Some circumstances connected with it are somewhat curious, especially the absence of insect depredations and the ordinary diseases; while it seems to demonstrate the possibility of rearing heavy crops without the use of guano or artificial manures. But the importance the author attaches to it as a general method of culture, calculated to supersede those already in use, will scarcely, we think, from the following brief sketch of it, appear to be warranted by the circumstances of the case. He thus expresses his confidence in his method of culture:—

> We firmly believe—and we rest our belief on substantial grounds, long experience, and knowledge based on successful practice—that the fly, and early failures, may be easily got rid of, entirely and effectually prevented. The great object of the writer is to show this, and prove it to demonstration, if necessary. We have cultivated turnips over thirty years, sometimes in moderate quantity, sometimes extensively, on clay, calcareous, and silicious soils; on alluvial and peat of various kinds. We have grown them in the north, east, and west of Ireland, all the various kinds sowed in their proper seasons; and we can now confidently state that at no time during that period, nor in any locality, have we had failures, nor suffered from the fly. . . . . . Every man of judgment acquainted with the subject must admit that 20 tons is over the average yield of the whole country, and double the quantity very common, and easily raised upon land of average quality, by good labour, manuring, and judicious management. We have seldom had less of a return, very often more, during the last three years, getting 30 to 35 tons per Irish acre off inferior bog-land. . . . . Though the fly was all around us busy everywhere, we pledged our reputation to make the turnips grow in defiance of hot dry weather, fly, or any other retarding cause.

The great secret of his success, he thinks, depends chiefly on the manure employed. He expresses his utter want of patience with those extensive and continual purchasers of guano—a very good manure certainly for turnips, and under certain circumstances very convenient and necessary; but it is evanescent, expensive, and must eventually wear out and be exhausted. His main reliance, therefore, is on the stimulating manure, which he names *home-*

made guano. The mode of preparing it is as follows: he commences to collect the materials at the end of the turnip season in July, when all former manures have been used and exhausted :—

We have a pit by itself, independent of the general manure-pit, for its reception. This pit communicates with and receives any excess of liquid that may escape from the large pit; also with the kitchen, scullery, water-closet, &c., &c., receiving everything in the form of manure that is valuable and useful; into this also is poured, as well as the necessaries connected with it, all ashes from the fires, in many cases from consumption of materials, turf on farm or in the bogs, all sweepings of the houses and yards. It may be mentioned, that all kinds of ashes are particularly grateful to the turnip. We sometimes add *dry* peat-mould as the best deodoriser; we use this in the poultry-houses, pig-yards, &c., and when fully saturated, add to our heap; all green weeds from farm and garden before seeding, are likewise added; and in fact every vegetable and animal substance that will decompose in time, as the greater the number and variety of substance, the better the manure. Occasionally also we purchase some town manure from private and cottier houses; this is an excellent addition. All this we collect up to the following spring, when decomposition has made great progress, and the heap is one dark rich mass.—(P. 25.)

The further preparation of this manure for use is somewhat peculiar. As soon as dry weather sets in, in February or March, the pit is cleared out, and the contents spread out in a yard with a hard dry bottom; and being turned at intervals, in about ten days the whole becomes pretty dry. It is then riddled or screened, the coarser riddlings returned to the pit, and the finer portion—the so-called home-made guano—reserved for application to the turnip crop, in the manner afterwards mentioned.

The ground is very carefully prepared, and by a process which we at once admit to be greatly superior to ploughing, but which, it will at once be seen, cannot be employed on an extensive scale, and reduces this mode of management to the character of a kind of horticulture. Late in autumn, or early in winter, the ground is *forked* over to the depth of 15 inches, thoroughly pulverised, and all weeds removed. In spring, or at any time during dry weather, manure is applied to the land, in quantities varying according to its condition; in some instances from 20 to 30 tons to the statute acre will be sufficient. This manure is forked into the ground to a medium depth; a process which removes any remaining weeds, and still further loosens and comminutes the soil. As a preparation for sowing, this manured ground is marked off into beds or ridges, 6 feet wide, with furrows of 2 feet between them, the earth from these furrows being spread over the ridges to give additional depth to the soil, while the furrows themselves are passages for air and light, and pathways admitting of easy access to the crop, for thinning, weeding, and clearing it. The process of sowing we shall give in the author's own words:—

To prepare for the seed, we have a dibble, a round stick about as thick as a spade handle: the old handle of a worn-out spade, with the cross-bar on top, and about $2\frac{1}{2}$ feet long, sharp at the point, does very well. A man, or boy, or woman, who has been taught and used to do the work, should be employed, for this is the most particular operation; this is *spacing* the crop. It must be done carefully and regularly. The operator stands upon the ridge, and, commencing at either side 6 inches from the brow or furrow, sinks the dibble straight down about 5 or 6 inches, making a rather wide, deep, and *clean* hole for the *stimulating manure*, going on straight across the ridge, making a similar hole at every 12 inches, until he comes to within 6 inches of the opposite furrow: he will thus have made six holes across, each 12 inches apart. He will next step back, and, commencing 18 inches from the former row, go straight across, making other six holes, each 12 inches apart; and will thus proceed over all the ridges, until the whole ground is thus spaced and perforated. In order to insure uniformity and regularity in the spacing, it will be necessary to have the distances, 12 and 18 inches (or such other distances as may be preferred), marked upon the dibble, so that the operator may lay it on the ground when necessary; but in a short time an intelligent person will have become so well acquainted with the proper distances that he will seldom require such application. Immediately after the dibble (the opening of the holes) comes the *stimulating manure, home-made guano.* A woman or boy carries this in an apron or small basket, it being left convenient in heaps on the headlands or in the furrows; she follows the dibbler, *dropping a moderate handful into every hole*, which all but fills it, leaving a small hollow for the seed, and a slight cover of fine earth. She keeps pace with the dibbler without difficulty, and it is obvious a very stupid person may manage this part without making mistakes. *Now this is our great principle, the true secret of our success.* The shaking of the seed immediately over the manure and in clump, is equally simple, and may be done by a child in several ways—by a bottle, cork, quill, &c. We use a small implement in the form of a tin tea-pot, the spout straight, 12 inches long, and slightly tapering to the point, which is about one-half inch in diameter: to fasten on this point is a small tube, solid at first on the outer end, but perforated with small holes (four or five) to allow the seed to pass. These holes may be widened at pleasure, to increase the quantity dropped. The seed is put in, the top carefully closed; the sower goes on very quickly, following the dropper of manure, giving the little implement a couple of shakes, the spout being immediately over and close to the manure; the seed in sufficient quantity (say from 10 to 20 grains) is thus snugly and securely deposited in its grateful bed. It is then covered up with a spade: it is only necessary to give the side of the hole a slight touch with the back of it, which gives sufficient cover of fine earth; then a second clap on the surface, which consolidates and binds all together, the earth, manure, and seeds—and this ends the whole operation.

The plants thus spring up in insular rounded patches or clumps, at due intervals from each other, and they are thinned by the hand, the most vigorous plant in each being left to form the future crop. It is affirmed that by this method at least one-third greater weight of produce can be reared than by sowing in drills in the usual manner. The author's animadversions on the latter method are, in some respects, not void of weight:—

Often (he says) a large space of land is cross-ploughed, turned over n dry spring weather, a large surface exposed, repeatedly stirred, harrowed, rolled, grubbed, or ploughed; these operations repeated, exposing new surfaces to dry sun and air for the purpose of cleaning and comminuting. And all this is very well if the important process of sowing the seed were correct—but this thoroughly dry land is usually drilled up in considerable quantities, exposing a great surface to be still better dried; the dung or guano is deposited and covered up; the seed sown with a machine along the top of the dry, parched drill, and but slightly covered, left to take its chance. If dry weather continue or succeed, which is generally the case at this season, what are we to expect? The seed may be a month or more without vegetating—have perhaps to be repeatedly resown; but some may appear occasionally straggling and weak, to be picked up by linnets, or cut off by the fly: the end is a failure more or less. But if even an opportune shower should fall shortly after sowing, and the seed vegetate quickly, still, for want of a sufficient stimulant to hurry them on, the young tender plants have a long time to struggle, and their roots a long way to penetrate, before they reach the manure below: the longer they are before the bulb begins to form, the lighter the crop will be on the ground when full grown.

These notices will be sufficient to convey an idea of the method of turnip-culture which the author recommends. It is only with some kinds of manure that it would be safe to mingle the seed; but when this can be done, there can be little doubt that, in most cases, germination would be more speedy, and the growth of the young plant promoted. It is possible that the proximity of the manure may have the effect of keeping away the turnip-beetle: it is very sensitive to smells; and we have known instances in which it was repelled by a mixture of flower of brimstone with the seeds. The young plants also grow more rapidly when there are a considerable number of them together; it is therefore desirable in all cases not to be sparing of seed. Upon the whole, this method of culture may suggest useful hints to those who cultivate the turnip on a small or moderate scale; and it is only in such cases, we think, that it may merit some attention.

*The New Method of Planting, Setting, or Dibbling Grain, Pulse, Mangold, &c.**—In our article in last Number on "Notes on Novelties at the Agricultural Shows of 1857," we described the corn-dibbling machine invented by "Sigma," the *nom de plume* of a gentleman who has long devoted his attention to agricultural mechanism, and promised to notice the pamphlet in which the system for which the machine was designed was explained, and for which its use was advocated. This we now propose very briefly to do. The system is called by Sigma a new one; it is not so, however, for "dibbling"—it is neither more nor less than this—has long been known and practised; but inasmuch as the machine which Sigma proposes for use enables the process to be

* By SIGMA. Ridgway. 1s.

carried out in a much quicker and more economical way than has hitherto been attained, and affords, in consequence, a probability of the method of planting being more extensively adopted, he conceives it placed on such a different basis of practical possibility that it may well be named a new system. "To the general public," says Sigma himself, "it has hitherto remained unknown, and therefore to them I do not hesitate to proclaim it as 'the new method.'" "In reviewing my last pamphlet," says the author, "the editor of the *Agricultural Gazette* states, that 'although the practice of seeding grain, as recommended by Sigma, be old, still the implement that has been devised by him for the performance of the same being new, it may well be entitled the new system.'" The better title would be, we conceive—conveying nothing calculated to mislead—"Sigma's method of dibbling," &c.

With respect to the advantages of dibbling, the author gives the following as his *experience:* "All things being equal, whether the soil be rich or poor, light or heavy, drained or undrained, I have found a 'set' wheat succeed better than when drilled or broadcast, merely because each plant has an even space allotted to it; and it is pressed in by the small steel dibbers (described in the article above alluded to) at a proper and uniform depth. I do not mean to say that 'planted or set wheat' does not succeed better in some lands than others; but what I affirm is, that, everything being equal, of two pieces of land of equal size, one 'set' (dibbled) with wheat, the other drilled or broadcast, the 'set' land will produce a heavier and more healthy crop, and with straw *always* standing stiff and erect through all weathers." "If you seed early," he says at another part of the pamphlet, "and place the plants or stools (containing 4, 5, or 6 plants to each stool, growing up out of a small hole as a single plant) at 9 inches apart every way—you will find that before winter the plants or stools will become so bushy and circular that the intermediate soil will hardly appear; the plants will be three times the size of those 'thickly seeded,' having room to extend their shoots every way; the roots likewise, having a longer time for growth, will be found, if examined, to have extended a great depth after their food, particularly if the soil be poor and well drained. Here it is not an unusual thing to be able to trace them 5 feet below the surface. The roots that extend sideways also in poor land seek their food at great distances, searching for inorganics to stiffen the straw, and stay the plants in winds and rain. To a crop of this description, where the land is so poor that the plant has to search far and wide through the soil for food, a little guano in spring has a most marked effect. This is my plan of growing wheat; my plants become giants, not pigmies, and bear a crop in proportion." It is to be noted that Sigma does not advocate single plants; the plants, 4, 5, or 6 in number, must grow out of a small hole as a single stem, and form apparently

one plant. On this he says, " In field culture, the destruction of both plants and grain by birds, vermin, and winter, would soon bring ruin on my system."

As corroborative of his own experience, Sigma notices that of Mr Piper, of Colne Engaine, Essex, who dibbles his seed at 2 pecks to the acre early in the season, and who, for twelve years consecutively, has grown wheat after wheat on the same land, averaging 39 bushels per acre, with a profit of L.6, 19s. 3d. per acre; and this—which constitutes the peculiar feature of the case—without ploughing, digging, or stirring the soil—merely cleansing the surface to kill the weeds, and varying his manure, giving soot one year, lime another, and guano another. Again he draws, from a frequent occurrence in agriculture, another corroborative evidence of the value of dibbling. " How many instances," he says, " could I relate of farmers being about to plough up a 'miserable-looking piece of wheat,' so thin that I have heard them say they despaired of ever getting back their seed? On the approach of spring, the plants of what had been called a 'wretched piece of wheat' have stocked out, as it is termed; they have had room to grow in the circular form, as nature intended wheat should grow. This 'wretched piece,' to the surprise of every one, has become the best piece on the farm. . . . . . All that wheat plants require is to assume the *circular* and *natural* form, and not be interfered with by too near neighbours or stools. Plants placed 9 inches by 9 apart will grow into one another; and I have known, even at this distance, plants on too rich land to be crowded and unhealthy in consequence, so that the farmer's own experience and judgment must be kept continually in play." Experiments to test the value of the system have been made by Sigma on the large scale, and on his recommendation others have carried it out on hundreds of acres of land, although the implements used were not so well devised, or so efficient, as the new one which we have already described. One of the first converts to the system was Mr Griffin of Endon, near Daventry, Northamptonshire, who dibbled barley at the rate of 2 pecks to the acre. The crop produced was equal to 10 quarters of grain to the acre, besides 2 tons 6 hundredweight of straw. The barley produced sold for seed at an increased price, and was known as Griffin's Prolific Barley.

The machine or corn-planter of Sigma is stated by practical men who have tried it to obviate all the defects and inconveniences of the old system. The seed is deposited at a uniform depth; the holes made by the dibbles are so small, that the difficulty existing in the old is not met with in the new system—namely, that of filling up the holes in wet seasons. The corn-planters are made so as to deposit the seed in rows 9 inches apart, the intervals between the rows being also 9 inches apart; the plants come up in squares, which allows of every facility in hoeing.

As to the season for dibbling, Sigma states that he has always met with the greatest success when it has been done early in the season, from the latter end of August to the first week in October. Three grains in each row are thus sufficient, the rows being 9 inches apart. The depth varies according to the soil: in light land, 1½ inches; in heavy, 1 inch, and not deeper than this. In the course of two months the plants will nearly trench. If dibbling is done later in the season than the above periods, the number of seeds in the holes should be increased, as birds have little to eat, insects abound, and many things conspire to retard, if not stop, the progress of vegetation. Even when the seed is dibbled late in the season, the intervals should not be less than 8 inches; this interval in the row, and 9 inches from row to row, gives a superficies of half a square foot. After the first of October, 5 or 6 grains are recommended to be deposited in each hole, this giving, in an average sample, 5 gallons to the acre. One ear growing in the above space, calculating it to contain forty-two grains, will give 20 gallons to the acre; but from one "stool" 20 to 25 ears, and sometimes 50, grew. "Forty bushels to the acre is called a good crop; but we must not," says Sigma, "be satisfied with this: considerably more may be grown, as I have often proved, and you may often be able to select particular spots in a dibbled piece of wheat that will produce at the rate of 70 to 80 bushels per acre. Why cannot we, by careful and scientific culture, by continued observation and experiment, cause the whole acre to yield the same quantity?"

As the method usually adopted for the prevention of "smut" in wheat would likely cause the grain to clog the tubes, Sigma recommends a method which has long been carried out in the hop counties with success. The wheat is laid on the hop-floor, and subjected to the fumes of sulphur, created by the consumption of charcoal in the space below. He thinks that a barrel with a canvass partition would probably suffice to carry out the plan.

The machine is also capable of dibbling mangold. In using it for this purpose, the steel dibbles are taken up, so as not to make the holes deeper than half an inch. The deposits are made 9 inches apart, or even 4½ inches if thick plants are preferred. The corn-planter is not suitable for dibbling beans or pulse, the holes being required much larger than for corn. Sigma has found a machine with four rows give satisfaction in the dibbling of beans, two rows at 6 or 7 inches apart, then a wide interval of 26 or 27 inches for horse-hoeing. Where it is desired to dibble beans in single rows, the depositors are placed 5 or 6 inches apart, with 6 or 7 in the implement.

In conclusion, we once more quote our author. "Few, until they have tried it, can form any idea what a crop of dibbled wheat is like; the seed being inserted at even distances, and at a proper

depth, it totally differs from every other method. The vigour of the plants—not the *over-luxuriance* of producing mildew, and all flag and no corn—the efforts made by nature to fill up every space, and, when further advanced, the stiffness of the straw, resembling sticks, the length and weight of the ears, are interesting and instructive to observe."

Premiums for Cattle at French Local Agricultural Shows.—Those who visited the Paris Agricultural Exhibition of 1856 were struck with the great variety of breeds of cattle which were native to France, and with the great diversity of form which prevailed among them. The contrast between the fine-skinned and portly Charolaise and Garonaise, and the rough-skinned cattle of Auvergne, and diminutive Bretons, indicated as great a difference in the climate, in the fertility of the soil, in the elevation and configuration of the surface, and in the treatment and uses of the cattle in France, as is to be found in any country. The local shows established throughout the kingdom, and countenanced by the Government, at which premiums are awarded for the improvement of the native breeds, prove that it is quite alive to the importance of keeping up the distinctions of these breeds, and also to their superiority over other breeds in their respective districts.

But while we commend the wise policy of the Government in their attempts to improve their native breeds, thus giving us reason to suppose that it considers these breeds the best adapted for the districts to which they are indigenous, we are wholly at a loss to understand upon what principle it acts when it offers premiums for the introduction of foreign breeds. Were it, at the local shows, to offer premiums for foreign breeds similar in form and constitution to the native breeds, and from countries or districts of country resembling those in which the local shows are held, in climate, elevation, &c., so as to introduce a mixture of foreign blood with the native, then would it be carrying out the principle it has laid down in improving the native breeds. If, for instance, encouragement were to be given for the introduction of the Short-horns to the plains of Garonne, of the West Highlanders to the mountains of Auvergne, of the Ayrshires to the inferior soils of Brittany, or if experiments were to be tried by introducing all these different breeds into one district, and separate prizes were offered for each breed, then no exceptions could be taken to the arrangement.

But unfortunately for the improvement of those native breeds, or the introduction of foreign breeds best suited for particular districts, there is no classification observed in awarding premiums for imported or foreign cattle. Thus premiums are offered for the "best cattle imported from other countries," or for the "best animals bred from imported cattle," without any regard whatever to the breed. Now the absurdity of bringing a short-horn into

competition with an Ayrshire, or even a Shetlander, without taking into account the adaptability of the breed to the district in which the competition takes place, is far too flagrant for us to put off any time in exposing it or holding it up to ridicule. Indeed, we are at a loss to understand how any sensible and intelligent man can undertake the duties of judge in such a case. Upon what grounds does he found his decision? If we are to judge from the awards given, we think that the most valuable animal, irrespective of suitability to a particular district, must be the one that is considered entitled to the premiums, as the short-horn generally comes off victorious.

Our attention has been directed to this subject by the perusal of two letters handed to us—the one from M. Bonnemant, an enterprising and distinguished agriculturist in Brittany, also familiarly known to many Scottish agriculturists for the liberal and gentleman-like spirit he showed in his dealings with one of their number during the Paris Exhibition; the other from Mr Douglas, a native of this country, but now resident in France, whose valuable services, as interpreter to the Scotch exhibitors at the same exhibition, and as the means of effecting many a sale of cattle there, are still gratefully remembered by many.

The following is an extract from M. Bonnemant's letter: "There are prizes given at the yearly shows by Government to *animals bred from imported cattle*. But by a most absurd arrangement, there is no classification made of these animals. Thus, those fitted almost entirely for the production of flesh, are brought into competition with those destined to produce milk, and the judges are thus continually placed in the embarrassing position of adjudging prizes to animals mixed together indiscriminately, and having among them qualities as different as black is from white. Owing to this most incomprehensible circumstance, the Durham, whose finely rounded proportions make the greatest display, is almost sure of success in all show-yards. Nevertheless this result, due to the absence of classification, tends to have a very baneful effect on the prosperity of our agriculture, concentrating, as it does, public attention on the Durhams, which, despite their many excellent qualities, is far from being the animal fitted to become a universal source of improvement in France, in which there are many districts where the climate, soil, and present state of tillage, render it impossible to furnish all the requirements of that breed. Suiting, as it does, the *flesh grower*, who may have nourishment in abundance for it, it can by no means answer the purpose of the inhabitant of a poorer soil, whose effects are limited to the production of milk and butter. It would be most desirable that the French Government were led to see their error in the want of classification, so that henceforth the absurd spectacle of dairy and butcher's breeds of cattle striving together in our local shows might be brought to an end."

Mr Douglas writes: "There are premiums given for the best cattle imported from other countries; and these cattle are put into competition without the slightest attempt at classification or consideration for their fitness for the country or part of the country into which they are introduced. Thus a Shetland, West Highlander, or Ayrshire might find himself pitted against the Durham; and of course one hundred to one the Durham would carry the prize, though the situation to which these different animals might be transported should be as wild as the braes of Lochaber.

"People in general are like sheep that leap where they see others leap. And many a man here (in Brittany) who would open his purse-strings, and lead Ayrshires home to his byres, if he saw them winners in fair competition among themselves, or against other milk-giving breeds, cannot now, as matters stand, do otherwise than come to the opinion that, because in public exhibitions Durhams, big, fleshy, and all-devouring, get always prizes, and the fine-drawn Ayrshires rarely, the former is the preferable breed."

M. Bonnemant, fully appreciating the valuable milking qualities of the Ayrshires, and their suitability for Brittany, has introduced a considerable number of first-rate animals of that breed. He has at present in his herd six Ayrshire cows and two bulls, which have been prize-takers at the Universal Agricultural Exhibition in Paris, and at the Highland Society's and several local shows in Scotland. But he finds that all his efforts to get them generally introduced into Brittany have been thwarted by the absurd but well-intentioned regulations of the Imperial government. Not a whit more absurd would it be were the Highland Society, in offering premiums for its district competitions, to make it a condition that Leicester sheep were to compete with Blackfaced in some local show in the West Highlands, or that Shorthorns were to be allowed to compete with Ayrshires in some bare upland district of that county. There is a great deal of truth in what Mr Douglas states, that many a farmer in Brittany, where the intelligence of the farmers is not of the highest order, would be very apt to select those animals for improving his stock which had gained the prize, without considering in the least its suitableness for his farm. We are sure that the attention of the French government requires only to be directed to the subject to introduce some improvements in its premium list.

Potato Disease.—Potato-growers have experienced another most disastrous season. We do not believe that more than one-third of the crop has been available for human food. As usual, discussions have been rife as to the cause of the disease, and preventives or remedies are no sooner suggested by some, than they have been proved to have been unsuccessful by others. Early planting has

been of late much in favour as a preventive of the disease; and yet, strange to say, the varieties which withstood the disease longest were the late ones, such as the Orkney Reds and the Irish Cups. But even these have at last succumbed to its ravages.

Manures of all kinds, and particularly guano and the light manures, were blamed as the cause. But here, too, there is great difference of opinion. We have ourselves seen in some years less disease where guano was applied than where it was not; and we attribute it to the fact that the plant was more liable to be attacked at a particular stage of its growth than at another, and that the guano having quickened its growth past that stage, it was unaffected by the disease when particular conditions in the atmosphere, inducing the disease, took place. It is, however, generally admitted that a large crop produced by heavy manuring is more diseased than a small crop more lightly manured under other equal circumstances. Mr Coleman, of the Royal Agricultural College, obtained last year a sounder and larger crop where farmyard manure was used than where none was used, as mentioned in the *Gardeners' Chronicle*.

Sulphur has also been recommended to be sprinkled on the sets before being planted, as a preventive of the disease. But a writer "W." in the same journal details an experiment where sulphured sets produced a larger but more diseased crop than plain sets. His experience with regard to using small potatoes for planting, instead of large, cut into sets, differs somewhat from ours. He obtained a much smaller crop from small potatoes planted whole than from large ones cut into sets. In an experiment we tried, we had as large a crop with the one as with the other.

The variety of potato, it is said, has had considerable influence in resisting the disease. The two most popular kinds for this purpose at present are the Flukes, and the White Rocks or Protestants. The former of these have, however, found some detractors, who maintain that, last year at least, they were even more diseased than Regents. We have now grown them for some years, and have always found them to produce a sounder crop than any other variety we ever tried. There was a round potato mixed with the Flukes when we first got the seed; it has never been separated from the latter. Last year we planted them together as usual, and when the crop was lifted there was scarcely a sound potato found among the round ones, while few or none of the Flukes were diseased.

There is one point connected with the disease which we think is seldom adverted to—viz., early lifting. In most cases the early varieties will be ready for lifting in the beginning of August. Of course, if the disease has attacked the crop before then, it is of little consequence whether they are lifted then or not; but for the last two years this has not been the case till the month of

ber; and we are convinced that, had the potatoes been nd pitted in August, the greater part of the crop would een saved. This was accidentally proved last year. A a field of potatoes was lifted in August and pitted, so as to ie ground for another crop; the rest of the field was allowed ain till the usual time of lifting, and, when taken up, the s were found to be affected with disease to the extent of rd of the crop. Those lifted in August were examined in ber, and were found then to be perfectly sound. This ss will not be held conclusive by many; but it is, at all an encouragement for them to try the experiment them-nother year.

rphosphate of Lime.—Mr A. Wilson, Regent's Park, , writing in the *Irish Farmers' Gazette*, of October 7, says: "I think it a duty before I die to contradict false tions by false guano-makers, who swarm in every part of d. I can prove to whom the merits of first introducing and itriolised bones, and native bone-earth, are justly and un-ly due.

ose who heard Dr (now Sir James) Murray's lectures at the Exchange, Dublin, in 1834, and again at Belfast in 1842, member how the noblemen and gentlemen of the first com-rganised to forward this invention (whose names are set the *Belfast Chronicle*, May and June 1842), demonstrated , progress, dates, and advantages of that discovery, and its deserts.

immond Anderson, Esq., the proprietor of that paper, there l the admiration which he and so many persons expressed ıg the luxuriant crops grown by Dr Murray on his lands, 'ields, Belfast, since 1809, by his spreading on the soil f superphosphate of lime from his chemical factory for phosphate of soda.

en Dr Murray was chairman of the Belfast House of in 1812, he presented to that institution a waggon-load ster murphies,' part of a field which the members of our ften visited, as a curiosity, to see potatoes growing over ed bones. The soil being doctored, as we called it, with a always previously used for preparing a medicine.

fabricators who cheat customers of money, will cheat s of fame. Thousands of spurious manure-makers, and fluid-magnesia-makers spread thousands of falsehoods. ienate the merit to those who do not want it. It is thus ron Liebig is lauded as the source of biphosphate for crops, ı he was not born when it was first producing them at

3. Lawes, now a manufacturer of it, was, against his will,

named also as its originator, although he was quite a young man when he rented Dr Murray's three patents, and paid him a 'royalty rent' for them in 1842. Dr Murray had been preparing it for green and grain crops extensively thirty-three years before his first patents were sealed. Mr Lawes also took a patent of his own, upon some modifications, after the first two were granted to Dr Murray."

AGRICULTURAL SUMMARY FOR THE QUARTER.

SELDOM have farmers been favoured with more propitious weather at this season of the year than what has prevailed during the last three months. October, November, December, have come and gone, and left in their wake but few traces of winter. A few days of frost in November, and one or two boisterous days in December, are scarcely remembered amidst the fresh balmy weather which prevailed throughout these months. The country in consequence, has by no means assumed its wintry look; the grass fields have as deep a verdure as they ever had in any month in 1857; the wheat is strong and thick on the ground, and the turnip stems show no symptoms of decay; the leafless branches of the trees alone remind us that "all nature dies" at this season. Farmers, we are glad to see, all around, have not been slow to take advantage of such favourable weather. The plough has scarcely been idle, excepting when turnips were being stored or wheat sown, the consequence of which is that a large breadth of land has been turned over. Very little stubble remains now to be done, and many fields, from which turnips have been removed, and a considerable portion of lea, have already been prepared for the seed in spring. We never recollect of seeing so many turnips stored as has been done this season; and this operation has of itself been no small labour, for, owing to the mild autumnal weather, there is a larger crop of them throughout the country than Scotland could ever boast of before.

The agricultural interest is now suffering severely from the effects of the monetary panic and general depression in trade. From the number of workpeople thrown idle and the reduction in wages, consumption has been considerably curtailed; and this added to the great importations of corn from the Continent, and the forced sales that have been made from the want of money, has lowered the markets very much. Nor have cattle-feeders, we are afraid, felt the worst of it; the high rate at which lean stock was purchased in, the great depreciation of its present value, and the fall in the price of beef—a fall likely to be continued for some time—will make feeding but an unprofitable trade this year. To give some idea in the fall of the grain, we subjoin the following note

The average prices in Edinburgh Market on 17th December 1856 and on 16th December 1857 :—

	1856.			1857.	
Wheat,	47s. $5\frac{5}{12}$d.	per Quarter.	...	38s. $11\frac{9}{12}$d.	per Quarter.
Barley,	36s. $3\frac{3}{12}$d.	„	...	27s. 3d.	„
Oats,	23s. $11\frac{6}{12}$d.	„	...	21s. $10\frac{1}{12}$d.	„
Beans,	53s. $1\frac{4}{12}$d.	„	...	36s. $11\frac{10}{12}$d.	„

It would appear, too, from much larger quantities being sold, that farmers are not inclined to hold on.

It is not easy to say at present whether it would be better to sell off or hold on. If there was to be any improvement in the manufacturing districts and in trade, there is no doubt that there would be a rise in prices, even in the face of the importations from America and the Continent: for we must recollect that the void caused by the almost universal failure of the potato crop must be filled up. But is there any prospect of an improvement in trade and manufactures? We are inclined to think that there is, for it must be borne in mind that the present depression is caused, not by over-production, or a glut in the markets with our manufactured articles, but by a derangement of our monetary system. Already in America, where the stagnation commenced, there are symptoms of a recovery ; in this country the pressure is not so heavy, and we trust that they have now seen the worst also in the north of Europe. The reason, therefore, for there being no orders for our manufactures is not because people do not require them at present, but because they have no money to pay for them. Immediately, therefore, that the money market becomes easier, we may expect orders from America, India, the north of Europe, and Australia. We believe, then, that the prices of grain will not fall lower than they are at present, and that it will be safer to keep on what of it is good : it seldom pays to store damaged or inferior grain.

Farm-Labourers—their Morals, their Education, their Houses.—One would suppose, from the speeches that are so often made at agricultural clubs and dinners, that our labourers are in a state of degradation, uneducated, and worse housed than pigs. They are now become a pet subject for speeches, and form generally the principal part of the eloquent perorations of after-dinner speeches. Now, while we do not consider our rural population as spotless specimens of humanity, or as those myths of Roman poetry, Corydon, Alexis, &c., we are as unwilling to believe them so low in the scale of morality as many would have us believe them to be. In our intercourse with them, we find them to be very much the same as other workpeople, possessed of the usual amount of human frailties, and a due proportion of the redeeming good qualities found in our race. We cannot say that more immorality prevails among them than used to be the case. The sin of fornication, so

frequently laid to their charge now, has been for a very long period a constant question brought before kirk-sessions, as their records can testify. Then we assert that drunkenness is not a common vice among our farm-labourers proper: the truth is, a ploughman's wage cannot afford to let him get drunk often throughout the year. We admit, however, that when several of them meet together, as on fair-days, they are apt to exceed; but even here we deny that they are worse, or even as bad, as other labourers. But is there no change in their character within the last forty years? We must confess that we do observe a change. While their wages are considerably higher now, they do not work with the same heartiness and zeal: masters complain that they do not get as much out of them for their money. Again, they do not appear to have their masters' interest at heart so much as servants of old. But masters themselves may be somewhat to blame for this, by widening the distance between them and their servants; for it cannot be denied that the relationship between master and servant has been considerably changed of late years. One consequence of this want of interest is a restlessness of disposition, a love of change manifested in the servants. They leave one whom they consider a good master, with the risk of going to a bad one, from no other assignable cause than that they want a change. We regret to add that that spirit of independence for which our Scotch peasantry were once so distinguished has been quite broken down. A few years ago, most of our rural population would have blushed to hear it said that their aged parent was on the paupers' roll; now, however, since the passing of the present poor-law, every device is too often used, every means is too often tried, to get their nearest disabled relations made constant recipients of charity.

The Inverness Farmers' Society lately discussed the state of our peasantry, whether it was "progressive, stationary, or retrogressive;" and the majority of the meeting came to the resolution that it was progressive. The subject, according to the report of the proceedings before us, was by no means fully discussed. Many important points were entirely overlooked by the speakers in their indignant protests against the encouragement of game by proprietors in their estates, to the total neglect of the labouring population settled, or rather once settled, on them; for the people, we understand, have been obliged to give way to deer and grouse, and seek a habitation elsewhere than on their native hills.

The education of the labouring classes has lately occupied the attention of the London Farmers' Club. The subject was introduced by the Rev. C. T. James in a very lengthened paper. He laid it down as an axiom, that the "effectual way to better the condition of the people is to better themselves, fitting them for the attainment of higher enjoyments." And the plea he used for the

sity of an improved education is, that "the more artificial on of agriculture at present, arising from the progress made achinery, chemistry, and mechanism; the extended use of licated machinery and scientific appliances to farm work, required a superior education to what labourers have been tomed to get. There was one point on which he insisted course of his remarks—viz., the industrial training of both and females, and particularly the latter. The suggestion by him on this head is especially deserving of attention. rticularly recommend," said Mr James, "for our adoption, has been found eminently useful, viz. an arrangement in parish for receiving in rotation the elder girls of the school he house on Saturday, or some day in the week, and letting tchen, laundry, and each department of the household work schooling for service in these, the much-needed school of in-." The resolutions passed by the Club were based on the ing suggestions, viz.: "1. That industrial training in suited to the district, and by the use of which the children working classes are afterwards to live, should form a part of ool teaching." "2. And that the progress in mechanism, e, and the arts, renders an improved judicious education ial to the labourers, while it would be highly advantageous farmers."

heartily concur in these resolutions, but would have wished e Club had added another regarding the religious education people. Experiencing the great benefits derived from our able system of parochial schools, at which the humblest can e, if not for nothing, at least at a very low charge, a good religious and secular education, we could wish that the same n were extended across the Tweed.

houses of farm-labourers are also attracting attention from blic generally. Presbyteries and synods are moving for in- s into reports on their state. We may tell these reverend that their inquiries will be productive of no good. Mr Henry mond, in his usual piquant style, at a late agricultural dinner, lluded to the subject, and treated it in its proper light. He d that, as regards proprietors who build cottages which are hat roomier than the ordinary ones, and which must cost at least, the rent obtained can never repay them for their ; while as regards the labourers inhabiting them, their wages t afford their keeping them warm and comfortable by having than one fire. This is certainly the commercial view of the on; but there is another view, which landlords must take in their farm, viz. that good cottages, whatever they cost, necessary to the tenant for the proper cultivation of the s a good steading. Our observation and experience of this on has led us to the conclusion that it is of no use building

many of the roomy cottages proposed by benevolent individuals, with the view of keeping the sexes more separate; for where it has been tried it has totally failed in its object: 1st, Because the people have generally no furniture to put into the house—which no doubt can be remedied, in some measure, by proprietors putting fixed iron beds and grates into some of the rooms; 2d, Because the habits of the people lead them to occupy and crowd most the room in which there is the single fire; and, 3d, Because the spare rooms are let out to strangers often of very questionable character, and the family confined to the same space as was found in the old cottages. We gratefully acknowledge the great good done by the Agricultural Cottage Improvement Association; but they have not yet met the great evil and great want of house accommodation for labourers on the farms in Scotland. Ask the farmers, and most of them will tell you that it is not so much the want of accommodation for the ploughmen and their families that they complain of, as the want of proper accommodation for the women required for the working of their green crops. Many are driven to erect female bothies very much against their own feelings and will. We object to bothies of both kinds, and particularly to female ones, as most corrupting in a district; and it would be well were those who are always lecturing farmers, to suggest good practical substitutes for them, or the best way of regulating them.

Steam Culture.—If we are to judge of the importance of steam cultivation from the number of men of ingenuity who have devoted their time, their fortune, and their talents to its application to practice, we would say that few operations on the farm ought to engage the attention of the farmer more. Lord d'Eresby, Lord Tweeddale, Usher, Smith of Woolston, Williams of Wiltshire, Collinson, Hall, Fowler, Boydell, Romaine, and Halket, have all produced steam cultivators of one kind or another, and have concentrated their faculties and energies in trying to bring their inventions to perfection. The machines before the public may be divided into two classes: 1st, Those on the traction principle, in which the engines remain stationary at the ends of the ridges while drawing the ploughs or other implements; and, 2d, Those in which the engines move over the surface, either drawing after them, or having fixed to them, the cultivators. Again, there are peculiarities in the travelling engines: Boydell's, for instance, has a self-acting railway attached to it; while according to Halket's system, a permanent railway is to be laid down over the farm, involving a first cost of L.27, 10s. per imperial acre.

As we have not seen any of them at work but Usher's and Fowler's, and as the latter only came under our observation during the last quarter, we will confine our remarks to it. As is well known, at the suggestion of the Stirlingshire Agricultural Society, a premium was offered by the Highland Society "for the Practical Application of Steam or Water Power to the Ploughing or

Digging of Land." Fowler's machine was the only one entered for competition. The trial took place in the Carse of Stirling, on the farm of Stewarthall, occupied by that spirited farmer Mr Forrester, whom, though many winters have passed over him, we were glad to see still vigorous in health, clear in intellect, energetic in spirits, and still occupying that prominent place in the vanguard of agricultural improvers which he has held for the last thirty or forty years, leading on younger men in the path of progress. We do not intend to enter here upon a minute description of the mode of action of this machine—suffice it to say that a locomotive engine, with apparatus attached to it for winding up a wire-rope, is placed at one end of the ridge, and at the other a machine called the anchor, which possesses a particular gearing, round which the wire-rope turns, so that the course of the ploughs is reversed after being drawn towards the engine. The ploughs are attached to a large framework, so many at one end of it, and so many at the other, with the mould-boards so placed that the field is ploughed continuously along without ridges, or the necessity of turning the framework at the ends of the furrows. The wire-rope runs on movable pulleys placed on the surface along the length of the furrow. The engine and anchor are moved along the end ridges, when required, by means of the steam.

The work done by the plough was most excellent. The trench-ploughing, in particular, was superior to anything we ever saw executed; the furrow was both well turned over and thoroughly broken; and all this was done without the least poaching to the land from horses' feet, and without our being compelled to witness the straining of the animals, which must have taken place had horses been employed to turn over such a furrow. The machine was afterwards exhibited at work at Saughton Mains, where also it gave satisfaction to those who witnessed it. We think that the committee of management were quite right in selecting ground where a machine like Fowler's plough could be shown to greatest advantage; and in making up our estimate of its value, we should always bear in mind that it was working under every advantage. In such circumstances, we must confess that we were not a little disappointed at the breakages that were constantly taking place. We must no doubt look for breakages and numerous stoppages in the starting of all new machines; but this could scarcely be called a new machine, as it had been working for some time in England. The truth is, the strength of it did not appear sufficient for the strain put upon it; and the engine was working under such a pressure of steam as would have frightened most of the spectators from the field had they known of it. We are informed, by those who examined it at different times, that there was a pressure of 70 lb. to the square inch on the boiler. Nor have we any sufficient data to go on for the tear and wear of the wire-rope, which we fear will be greater than even the most unfavourable estimates yet

made of it. These are defects which time will remedy; and we are the more pleased at the thoughts of this, for, though the machine of itself is not perfect, the work performed by it is certainly the best of the kind we ever saw. We understand that Mr Fowler has orders for several, and that some are already at work in England. Most of the farmers in Scotland, however, may console themselves with the prospect of requiring horses to perform their ploughing for some time to come, as the machine cannot work where there is rocks or land-fast stones; and we believe that four-fifths of the land in Scotland are more or less in that position.

Societies.—Two most important and interesting meetings of the Society of Arts, and of the London Farmers' Club, have been held, at which papers were read, one by Mr Sidney "On the progress of the agricultural implement trade during the last twenty years," and another by Mr Nesbit on the theory of drainage. Mr Sidney, in a long paper, travels over the whole ground of agricultural machinery during the last twenty years, but does not introduce anything new or practical in his remarks. Mr Nesbit combats the opinion on which the agricultural mind, particularly in England, appeared to have run wild some years ago—viz., that increased depth was a compensation for increased width. In too many instances has this been found to be an erroneous opinion; and we know numerous cases in which many acting on it put their drains 4 feet deep and 30 to 36 feet apart in clay soils, and have been obliged to put in drains in the intervals before the fields can be drained thoroughly.

Law Decisions.—A Morayshire farmer bought some rye-grass seed from a Mr Morrison as perennial. He sowed it, gathered seed the first year, and sold it to another farmer as perennial. When sown in the land of the latter, it turned out to be annual. He therefore brought an action against the Morayshire farmer for damages for loss occasioned by the grass turning out to be annual. The case was carried successively to different courts, all of which, the Sheriff-Substitute and Depute, the Lord Ordinary, and the Second Division of the Court of Session, decided in favour of the Morayshire farmer, holding that he was justified in believing that he was selling perennial seed, and that the other farmer on whom the onus of proof lay had not proved at all that the seed was not perennial.

A Mr Paterson of Dundee delivered potatoes on board vessels at Dundee to be shipped to Messrs Guild, who have potato-mills at Leven. During the voyage the potatoes lost weight. The action was brought to test the point whether the payment was to to be made for the potatoes at the *input* weight at Dundee or at the *output* weight at Leven. The Sheriff decided that Mr Paterson was entitled to be paid for the quantity of potatoes put on board at Dundee.

AGE PRICE OF THE DIFFERENT KINDS OF GRAIN,

PER IMPERIAL QUARTER, SOLD AT THE FOLLOWING PLACES.

LONDON.

t.	Barley.		Oats.		Rye.		Pease.		Beans.	
d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
0	43	6	26	6	42	6	44	3	43	5
0	42	11	28	6	39	4	42	7	43	7
6	43	10	31	2	37	3	47	2	43	1
9	44	7	32	2	40	0	45	3	42	10
7	43	2	31	5	39	4	49	7	44	1
9	44	11	28	3	38	3	46	8	42	4
1	44	10	29	0	37	10	49	6	40	3
4	44	5	29	5	37	6	50	10	41	10
9	43	1	27	2	38	0	51	7	42	9
9	44	9	29	4	38	3	48	0	41	8
9	41	11	26	3	35	10	49	11	42	11
11	39	0	23	11	38	2	47	3	42	5
0	33	0	26	0	35	6	45	8	40	3

EDINBURGH.

Date.	Wheat.		Barley.		Oats.		Pease.		Beans.	
1857.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
Sept. 2	49	6	35	11	32	3	46	6	47	11
9.	49	7	37	8	31	10	47	3	48	1
16	48	10	37	9	31	2	48	8	49	2
23.	49	2	36	10	29	10	48	10	49	8
30.	47	5	34	8	29	0	47	6	48	5
Oct. 7.	51	7	35	6	29	2	47	2	48	4
14.	53	0	36	8	28	1	46	6	47	5
21.	54	0	36	0	28	5	45	6	46	3
28	51	6	33	10	26	1	45	8	46	1
Nov. 4.	47	7	32	7	25	2	43	2	44	4
11.	42	11	31	6	23	9	42	6	43	1
18	39	10	28	2	22	1	39	8	40	9
25.	37	3	27	9	23	7	38	6	39	4

LIVERPOOL.

at.	Barley.		Oats.		Rye.		Pease.		Beans.	
d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
0	42	10	29	1	42	2	42	6	43	4
11	43	6	28	9	39	8	43	8	44	2
2	42	4	28	6	38	4	44	6	48	1
2	43	9	26	5	37	2	44	0	51	10
0	44	2	27	7	39	6	45	2	51	5
1	43	4	27	8	38	4	46	8	49	0
2	42	8	24	10	37	8	48	4	47	10
6	41	7	25	0	37	2	47	6	47	1
8	41	8	26	9	38	2	48	8	44	11
7	40	6	25	2	38	4	48	6	46	2
10	39	10	26	6	35	8	46	4	47	9
1	37	2	23	0	30	2	44	2	44	1
9	37	6	22	8	35	4	41	8	44	6

DUBLIN.

Date.	Wheat, p. barl 20 st.		Barley, p. barl. 16 st.		Bere, p. barl. 15 st.		Oats, p. barl. 14 st.		Flour, p. barl. 9 st.	
1857.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
Sept. 4.	32	4	19	8	16	2	15	1	22	6
11.	33	0	20	9	16	0	15	4	22	8
18.	32	6	21	0	15	10	14	9	22	9
25.	31	6	19	3	16	1	14	1	22	7
Oct. 2.	31	10	19	9	15	6	14	2	22	6
9.	30	6	18	2	15	1	13	7	22	3
16.	30	0	17	9	14	10	13	2	22	2
23.	29	0	17	9	14	8	13	0	22	1
30.	29	3	17	6	14	9	14	2	22	0
Nov. 6.	30	0	18	0	15	1	14	3	23	2
13.	29	3	16	6	14	6	13	11	23	1
20.	27	7	15	7	14	2	13	6	22	0
27.	27	8	16	6	14	0	13	2	22	0

LE SHOWING THE WEEKLY AVERAGE PRICE OF GRAIN,

terms of 7th and 8th Geo. IV., c. 58, and 9th and 10th Vict., c. 22. On and after 1st y 1849, the Duty payable on FOREIGN CORN imported is 1s. per quarter, and on Flour 4½d. for every cwt.

	Wheat.				Barley.				Oats.				Rye.				Pease.				Beans.			
	Weekly Average.		Aggregate Average.		Weekly Average.		Aggregate Average.		Weekly Average.		Aggregate Average.		Weekly Average.		Aggregate Average.		Weekly Average.		Aggregate Average.		Weekly Average.		Aggregate Average.	
	s.	d.	s.	d.	s.	d.	s.	d	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
....	58	4	59	4	42	7	40	8	26	7	27	9	39	2	39	5	41	8	41	3	40	11	47	1
....	55	8	58	8	42	5	41	1	26	1	27	4	34	9	39	4	41	7	41	4	46	0	47	0
....	56	9	58	4	42	3	41	8	26	5	27	1	37	0	39	0	42	11	41	8	45	4	46	9
....	57	6	58	1	42	11	42	1	25	6	26	8	37	7	38	6	44	1	42	3	45	7	46	6
....	56	3	57	6	43	4	42	8	27	0	26	6	35	6	37	9	43	4	42	7	45	6	46	2
....	55	8	56	8	43	0	42	9	25	6	26	2	35	7	37	3	43	7	42	10	45	7	45	10
....	55	10	56	4	43	0	42	10	25	6	26	0	35	4	36	8	44	5	43	4	45	6	45	7
....	55	6	56	3	43	5	43	0	25	3	25	10	37	4	36	5	44	7	43	10	46	1	45	7
....	53	11	55	10	43	1	43	3	25	0	25	7	36	10	36	4	45	3	44	3	45	9	45	8
....	52	6	55	0	42	3	43	1	26	4	25	9	36	3	36	2	44	1	44	2	45	0	45	7
....	51	8	54	2	41	3	43	9	25	3	25	6	34	7	36	0	43	11	44	4	44	9	45	5
....	51	3	53	6	39	10	42	2	24	1	25	3	35	2	35	11	43	3	44	3	43	9	45	2
....	49	8	52	5	37	7	41	3	23	10	24	11	33	10	35	8	40	10	43	8	42	8	44	8

FOREIGN MARKETS.—Per Imperial Quarter, free on board.

Date.	Markets.	Wheat.	Barley.	Oats.	Rye.	Pease.	Beans.
1857.		s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.
Sept. ..	Danzig	52 0 - 58 0	32 0 - 42 6	18 0 - 25 0	30 6 - 36 0	35 6 - 44 6	35 0 - 43 [illegible]
Oct. ..		50 0 - 56 0	30 0 - 40 0	17 0 - 24 0	32 6 - 37 0	36 6 - 46 0	34 0 - 42 [illegible]
Nov. ..		46 6 - 54 0	28 6 - 38 0	16 0 - 22 6	29 6 - 34 0	34 6 - 43 0	32 0 - 40 [illegible]
Sept. ..	Hamburg	51 6 - 57 6	30 6 - 45 6	16 6 - 22 6	30 0 - 36 6	34 6 - 42 0	32 6 - 41 [illegible]
Oct. ..		50 6 - 55 6	29 6 - 38 0	17 6 - 23 6	28 6 - 32 6	36 6 - 45 6	30 6 - 40 [illegible]
Nov. ..		46 6 - 52 6	27 6 - 36 0	16 0 - 21 6	27 6 - 31 6	34 6 - 44 0	30 0 - 38 [illegible]
Sept. ..	Bremen	50 6 - 60 0	28 6 - 37 6	18 6 - 26 0	35 0 - 40 6	36 6 - 48 0	32 6 - 42 [illegible]
Oct. ..		49 0 - 58 6	27 6 - 36 0	16 6 - 24 0	33 6 - 37 0	39 6 - 55 0	35 6 - 45 [illegible]
Nov. ..		45 0 - 54 0	24 6 - 34 0	15 0 - 23 0	32 6 - 36 0	37 6 - 52 6	31 6 - 41 [illegible]
Sept. ..	Königsberg	50 6 - 58 6	28 6 - 37 6	17 6 - 25 0	36 0 - 42 0	37 6 - 45 6	33 6 - 44 [illegible]
Oct. ..		50 0 - 56 6	27 6 - 35 0	16 6 - 24 0	34 0 - 37 6	39 0 - 50 6	35 6 - 46 [illegible]
Nov. ..		45 6 - 54 0	25 6 - 34 6	15 0 - 22 6	32 6 - 36 0	36 0 - 48 0	31 6 - 42 [illegible]

Freights from the Baltic, from 2s. 6d. to 4s. 6d.; from the Mediterranean, 9s. 6d. to 12s.; and by steamer from Hamburg, 3s. 6d. to 5s. per imperial qr.

THE REVENUE.—From 30th June to 30th September 1857.

	Quarters ending Sept. 30. 1856.	Quarters ending Sept. 30. 1857.	Increase.	Decrease.	Years ending Sept. 30. 1856.	Years ending Sept. 30. 1857.	Increase.	Decrease.
	£	£	£	£	£	£	£	£
Customs	5,981,344	5,481,385	..	499,959	23,093,301	23,106,500	13,199	..
Excise	5,446,000	5,298,000	..	148,000	17,861,778	17,519,000	..	342,778
Stamps	1,770,649	1,752,255	..	18,394	7,180,041	7,346,223	166,182	..
Taxes	157,000	159,000	2,000	..	3,100,026	3,099,020	..	1,006
Post-Office ..	645,000	730,000	85,000	..	2,768,152	2,930,000	161,848	..
Miscellaneous	224,200	330,092	5,892	..	1,404,438	1,424,885	20,447	..
Property Tax	5,347,236	4,931,537	..	415,699	15,940,331	15,753,024	..	187,307
Total Income	19,571,429	18,682,269	92,892	1,082,052	71,348,067	72,178,652	361,676	531,091
	Deduct increase....			92,892	Deduct increase....			361,676
	Decrease on the qr.			989,160	Decrease on the year			169,415

PRICES OF BUTCHER-MEAT.—Per Stone of 14 Pounds.

Date.	London. Beef.	London. Mutton.	Liverpool. Beef.	Liverpool. Mutton.	Newcastle. Beef.	Newcastle. Mutton.	Edinburgh. Beef.	Edinburgh. Mutton.	Glasgow. Beef.	Glasgow. Mutton.
1857.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.
Sept. ..	6 6 - 8 3	6 6 - 9 3	6 6 - 8 6	7 3 - 9 4	6 6 - 8 3	7 0 - 8 9	6 6 - 8 6	7 0 - 8 9	7 6 - 8 9	7 6 - 9 0
Oct. ..	6 6 - 8 6	6 9 - 9 3	6 6 - 8 3	7 0 - 9 0	6 6 - 8 0	7 3 - 8 6	6 3 - 8 3	7 0 - 8 6	7 3 - 8 6	7 6 - 8 6
Nov. ..	6 3 - 8 3	6 6 - 9 0	6 3 - 8 0	6 9 - 8 9	6 0 - 7 9	6 9 - 8 3	6 0 - 7 9	6 6 - 8 6	6 9 - 8 3	7 0 - 8 6

PRICES OF ENGLISH AND SCOTCH WOOLS.—Per Stone of 14 Pounds.

English.	s. d.		s. d.	Scotch.	s. d.		s. d.
Merino,	21 6	to	27 6	Leicester Hogg,	20 6	to	25 6
.. in grease,	17 6	,,	22 6	.. Ewe and Hogg,	16 6	,,	23 6
South-Down,	21 6	,,	26 6	Cheviot, white,	16 6	,,	21 0
Half-Bred,	16 0	,,	21 6	.. laid, washed,	10 0	,,	15 6
Leicester Hogg,	18 6	,,	26 0	.. .. unwashed,	9 0	,,	12 6
.. Ewe and Hogg,	16 6	,,	22 6	Moor, white,	8 6	,,	12 0
Locks,	10 0	,,	12 6	.. laid, washed,	7 0	,,	9 0
Moor,	7 6	,,	9 6	.. .. unwashed,	6 0	,,	7 3

PARR *VERSUS* PISCICULTURE.

A TASTE for natural history, and pleasant recollections of the noble Tay, in whose waters we were early trained to swim and fish, attracted our attention to the doings of the Perthshire Pisciculturists, who, by the artificial rearing of salmon, are seeking to provide a remedy for the constantly decreasing supply of this valuable fish. In the March and July numbers of this Journal for 1857 we made our readers acquainted with the very gratifying result, and pointed out how important was the light thrown upon the natural history of the salmon by the extended experiments, so carefully conducted, in the breeding-troughs and rearing-pond at Stormontfield. The subject is of such importance, alike in its scientific and economical aspect, that we now recur to it, well assured that there are many desirous of information regarding it. In fact, the desire for this is so great that the superintendent of the Tay Fishings has had to write hundreds of letters in reply to persons anxious to practise pisciculture at home, or to transport salmon ova to the salmonless rivers of foreign countries. This is not surprising: the vast increase of a most grateful species of human food, and this by a process so easy and immediate—the facility with which the ova of all fishes may be transported to great distances,—hearing of all this has stimulated curiosity and self-interest. It was not in vain that M. Coste thus addressed the French Minister of Agriculture and Commerce, 7th February 1853: "Monsieur le Ministre,—Pisciculture, which had obtained among the ancients so high a degree of perfection, is in our days fallen to such a state of decadence that it is hardly reckoned among the least important branches of modern industry; and nevertheless, our social conditions have at no time more imperiously demanded of us to restore it to a level with the continual increase of our populations.

"It is, therefore, greatly to be desired, that in order to contribute to the solving of this important problem, the natural sciences should profit by the experiments that might be made, and should deeply enter on the means of turning modern discoveries into practical uses by organising new fish-ponds; by fattening certain species of fish, by giving them, through a suitable diet, a better flavour; and thus to create a source of wealth from which may be drawn, as from a granary of abundance, riches kept in reserve by the providence of the State.

"There exists not, I safely affirm—and I am about to prove it by results in my own experience—one single branch of industry or of culture, which, with less chances of loss, offers to realise more important benefits."

At first these glowing anticipations were coldly received in the

scientific and literary circles of this country. At the meeting of the British Association for the Advancement of Science, held in Glasgow in 1855, Mr Edmund Ashworth read a paper "On the Artificial Propagation of Salmon, and some Account of the Experiment at Stormontfield, near Perth." Mr Ashworth made the important statement that this experiment "had demonstrated the practicability of rearing salmon of marketable value within twenty months from the deposition of the ova." The *Glasgow Daily News* nevertheless informs us that some of the zoologists who listened to it took it upon them to declare that "however scientifically interesting the recent experiments in the Tay and other rivers might be, the system could *never prove to be commercially remunerative.*" The *Quarterly Review* spoke in similar prophetic style as to its unprofitable nature. Of the wisdom and modesty of such vaticination we had the happiness to give a speedy illustration, by publishing in this Journal the fact, that of the salmon taken in the Tay during the last two years nearly a tenth were artificially bred, and that the said tenth was equivalent to a rise of 10 per cent in the rental of the fishings! The Tay-fishing proprietors are abundantly satisfied with their multiplied fish, though possibly now somewhat sceptical as to the prevision of philosophers who take it upon them to assert that certain things can *never* be! We rejoice to be informed that some alterations are at present in progress at the Stormontfield ponds, which will tend greatly to the furtherance of the experiment of artificially rearing fish. It is now to be so conducted that we may reasonably anticipate that we shall be able to explain certain puzzling differences in the growth of the young salmon in the pond. These were visible all along, but became especially noticeable at the end of a year. While one portion of the same hatching was being captured in the river, beautifully-grown grilses, another portion was still in the pond, tiny creatures weighing not more than an ounce! Conversing upon this point with our Perthshire friends, we remember suggesting that possibly the ova of salmon reached the smolt state sooner than the ova of grilses, and that the small fish in the pond might be the fry of the grilse. Should this conjecture prove true, it will also help to explain the different sizes of the salmon on their first return from the sea. Some grilses weigh 2 or 3 pounds only, while others attain the weight of 9 pounds, or even more. It will be of the greatest importance should we succeed in finding out what age of fish is necessary for the production of ova which shall develop into the grilse of the larger size. Of course, care will then be taken to procure such ova for the breeding-troughs.

In all the previous years, when the breeding-boxes were stocked, no attention was paid to keeping salmon ova and the ova of grilse distinct, salmon ova being impregnated by the milt from a grilse, or *vice versâ;* and the consequence was, that when the fish arrived

at the parr state, it was impossible to note whether there existed any difference between the parr of salmon and grilse. We are informed that this has been remedied this season; and that, to illustrate still further the history of the salmon, the ova of salmon and grilse will be impregnated by the ripe male parr taken from the pond at Stormontfield. Mr Shaw was the first to make use of the anomalous fact in the history of the male parr which has so long excited observation;—we mean its being full of milt, while the female of the same age exhibits ova only in the rudimentary state. Mr Shaw successfully impregnated the ova of salmon with the milt of parr—a very strange but most veritable fact, we are persuaded, such is our confidence in Mr Shaw's honesty and powers of observation, although derisively denounced as an impossibility by Mr Young, and his coadjutor "Ephemera."*

The public interest in the artificial rearing of salmon will also, we hope, be increased by the process being witnessed in that wonder of wonders the Crystal Palace. Being at Sydenham last summer on a visit to a piscicultural friend, we joined in persuading one of the Crystal Palace directors that a salmon-breeding apparatus would be an attractive addition to the instructive contents of the Palace. Our friend, moreover, volunteering to supply the ova from Tay salmon, the offer was accepted; and there is now in the Crystal Palace a model river, stocked with ova of salmon in process of being developed. Contrary to our friend's wishes, it has been placed in the tropical department. As might have been foreseen, the excessive heat has been most injurious. Instead of being in a temperature of about 40° Fahr., they have had to endure one of about 60° Fahr. The temperature of fishes is from 2.7° to 3.6° higher than that of the medium in which they live; † so that we are not surprised to learn that the mortality among the ova has been great. The gentleman in Perthshire, who obligingly supplied them, is in wrath, declares the Sydenham naturalists "naturals," and wonders that they did not "put them below a clockin' hen!" A facetious friend observes that these unfortunate young salmon are parr-boiled (parboiled?)

We notice this mishap as a warning to all pisciculturists. Artificial *propagation* of fish is a misnomer, for nature will not be tampered with. Artificial *rearing* of fish is possible and profitable only by carefully studying their natural habits. With this exception, we have heard of no blunder in the management of salmon ova deposited in breeding-troughs.

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* *Book of the Salmon.* By EPHEMERA, assisted by ANDREW YOUNG, p. 179.

† LIEBIG'S *Letters on Chemistry*, p. 67. In order to prevent unnecessary pains to protect salmon ova from the effects of cold, it should be known that, if gradually applied, it does not injure them, and that they have been known to be frozen up in a sheet of ice without losing their vitality. Réaumur demonstrated that the eggs of many insects are equally uninjured by excessive cold.

But while pisciculture in Perthshire has thus excited so much attention, and been so successful in its results, we have now to acquaint our readers with a dire misfortune by which it has been overtaken. It has fallen into the hands of the lawyers, and a legal decision has been pronounced most injurious to its future interests, although, we admit, in harmony with the letter of the law. This, however, we hope to persuade our readers, is a case in which the wrong to the public is so manifest as to demand the speedy interference of the Legislature, in order that the spirit of the law for the conservation of the *Salmonidæ* may not be destroyed by rigid adherence to its letter.

The title of this article may lead the uninitiated to suppose that pisciculture has got into some legal difficulty with an ancient angler of the name of Parr, indignant at the liberties taken in abstracting ova from parturient fish. These, no doubt, are illegal, according to the Act which renders the possessors of salmon spawn subject to penalties; and it is true that the Stormontfield experiments were in danger of never being made, in consequence of a Perthshire official threatening to interdict the fishing-proprietors of the Tay from unseasonable tampering with female fish. "Peter of the Pools," whose dexterous manipulation of gravid salmon promises to immortalise him as a very Simpson in this new department of obstetrics, has not yet been pounced upon by the Fiscal, and ere long may have no dread of him, in consequence of the passing of the new Salmon Bill for the Tay, in which there is a clause authorising the taking of salmon ova during close time for the purpose of artificial breeding. We have not selected our title with reference to a man denominated Parr. Our object is to show that the mysterious little fish termed parr, and a recent decision regarding it, offer most serious impediments to the successful prosecution of pisciculture, and that, unless the law be altered, the salmon will be almost exterminated.

The case stands thus: In all rivers frequented by salmon—and, it is believed, in none else—there is found throughout the year a small fish, known in Scotland as the parr, and in England as the brandling and the fingerling, from the finger-like marks on its sides. It was never known to breed. We shall exhibit the ignorance that prevailed regarding it till about twenty years ago, by quoting a sentence or two from the article "Angling" in the *Edinburgh Encyclopædia*:—

"[illegible] apprehend no Latin specific name has yet been [illegible] to this fish. It has, indeed, been ranked [illegible] distinct species, under the appellation 'Samlet,' [illegible] *Salm*[illegible] well known, however, all over the king-[illegible] fish is said to be a mule, the [illegible] out. From their emitting a [illegible] salmon milter, many

believe them to be all males: and some of the fishermen upon the Tweed, from this circumstance, allege that they are the male salmon-fry, that do not go down to the sea till winter. Others affirm—and, we think, with strong probability, if not certainty—that they are the young or fry of the sea-trout." *

The fishermen on the Annan are said, for at least a hundred years, to have believed that the parr was the young of the salmon. The most of our naturalists, however, regarded it till lately as a distinct species, and the tacksmen of the principal salmon-fisheries were of the same opinion. Some members of the Legislature seem to have suspected the intimate connection of parr with salmon; for in 1824 we find a select committee of the House of Commons thus questioning G. Little, Esq., a very extensive holder of salmon-fishings both in Ireland and Scotland: "Are you acquainted with a small fish called parr, found in salmon rivers?" The reply was, "I have seen them; but I consider them merely a fresh-water fish, or a species of fish by themselves, not at all connected with the salmon. I never examined them." It is thus apparent that the general belief was adverse to the theory of the parr being the fry of the salmon; and so it remained till the publication of Mr Shaw's experiments, commenced in July 1833, prosecuted till the close of 1838, and made public in the *Transactions of the Royal Society of Scotland* in 1840. We need not detail them, as they are now well known. They demonstrated that the hitherto mysterious and neglected parr was in fact the fry of the salmon. As to the existence of what some, even after the publication of Mr Shaw's experiments, persist in terming parr, an adult, as they suppose, of the river-trout species, we thus wrote in our first article on salmon and pisciculture: "As the distinction betwixt the young salmon in the parr-like state and the so-called trout-parr is not obvious to common observation, the prudent course is to regard them as identical, and to preserve them with the utmost care. Considering that twenty years have elapsed since Mr Shaw demonstrated that what is commonly called parr is in truth a young salmon, it is marvellous that the proprietors of salmon rivers should so carefully watch over the young salmon during the two months when they chiefly assume their silver coats, but permit, for ten months in the year, the unrestricted slaughter of parrs, which, notwithstanding the existence of the very similar parr-trout, ought assuredly to be considered as the young of the true salmon."

The proprietors of salmon rivers have at last been roused from their incomprehensible neglect; and more than a year ago we noted the following paragraph in the *Berwick Advertiser*:—

"THE PARR QUESTION.—We understand the Tweed Commis-

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* This theory is set aside conclusively by the experiments detailed in Mr Shaw's *Memoir on the Salmon-Trout of the Solway*.

sioners have now under their consideration a proposal to prohibit the destruction of this fish; and from the result of recent experiments, there remains but little doubt of their being able to prove that the parr is 'the fry of salmon, or of fish of the salmon kind,' which renders persons taking or killing the same liable to the penalties of the Tweed Act, the same as for taking smolts. Should the above proposal be carried out, it will virtually shut up the river to strangers, as it requires a person of some experience to distinguish the difference between the parr and river-trout of the same size; although we see no reason why there should be so much stringency against killing the fry as smolts for two months in the year, and their destruction without let or hindrance for the other ten months." We are not aware what was the decision of the Tweed Commissioners, but a recent decision in Perthshire has shown that they may find unexpected difficulty should they attempt to put an end to the slaughter of the parr. To this decision we invite attention, because of its manifest tendency to destroy the young of the salmon. If every boy and adult angler shall be permitted to catch parr as heretofore, pisciculture must be prosecuted on the most extensive scale in order to make up the deficit in the numbers of the young salmon mercilessly captured by anglers. But as art cannot, in this instance at least, successfully compete with nature, we may confidently anticipate that pisciculture will only supply a partial remedy for the senseless slaughter of the salmon in the early stage of its existence. For the prevention of this there is no legal provision it seems; parr are not proved to be the young of the salmon beyond the possibility of dispute, argues Sheriff Grahame; therefore they may be legally captured at any time.

The circumstances which led to the deliverance of so important a decision are briefly these: A certain Andrew Shaw, residing at Dunblane, ignorant of, or not choosing to believe, the fact of the identity of the parr and the smolt, as established by his namesake at Drumlanrigg, and by the pisciculturists at Stormontfield, has been prosecuted at the instance of the proprietors of the river Allan and its branches, for having, "contrary to the provisions of the Act of Parliament of George IV., chap. 39, sect. 4, wilfully taken [illegible] from the river Allan, or there wilfully [illegible] in h[illegible] the 1st October 1857, certain smolts or [illegible] salmon kind." The defence was [illegible] ays parr, and that the fish [illegible] nd;" and the Sheriff not only [illegible] iable to the defender in £5 [illegible]

[illegible] the great thereon was the joy [illegible] anks [illegible]," and [illegible] t parr, dangling from [illegible] n a procession which fell foul of [illegible] his carriage [illegible]

shouting and yells, accompanied in some cases by blows which nearly smashed the windows." The journal which records this disgraceful violence is confident that "this first decision in reference to parr will rejoice the hearts of anglers in all parts of the country." We are not sure of that: we should as soon expect a sportsman to rejoice that a sheriff had declared in favour of the right of all and sundry to kill young partridges during close-time. Supposing parr to be only parr, why should it not be protected during its spawning season? And if it be the young of the salmon, why should the men of Dunblane riot in the anticipation of its slaughter? Would "Jessie, the flower of Dunblane," smile on the youth who should glory in the privilege of slaying her father's chickens and ducklings? We have not the slightest interest in salmon-fishings; we have angled all our days, and in our ignorant youth have filled many a basket with parr; but now, when we have attained to a right understanding of the genealogy of this little fish, we treat it with respect, and are willing, as all reasonable anglers should be, that it shall receive the same protection which the law provides for all "fish of the salmon kind."

We do not object to the judgment pronounced by Sheriff Grahame. Very probably he agrees with us in regarding the parr as the young of the salmon; but the legal question for him to decide was this, Was it so regarded by the framers of the Act under which Shaw was prosecuted? In the note attached to his decision it is observed, "The complainer cannot pretend that it was the intention of the Act on which he founds, at the time of its enactment, to include the fish called parr as 'a fish of the salmon kind.'" "In none of the numerous and very severe Scotch acts passed for the protection of salmon, previously to the passing of the 9th Geo. IV., has the Sheriff-substitute been able to find any reference whatever to the parr as being a 'fish of the salmon kind;' and at the date of the passing of that statute there was certainly no general opinion favourable to the identity in species of the parr and the salmon."

This being undeniably true, we must admit that parr cannot be sufficiently protected by the present law regulating salmon-fisheries. A new enactment must be sought for, in which they shall be specifically named and included among fishes, the possessing of which, or the fishing for which, shall be forbidden during close-time. Luckily for the salmon-fishing proprietors of the Tay, they are about to present to Parliament a new Fishing Bill for the regulation of that river. With a disregard of their interests which is incomprehensible, we find that it contains no mention of parr. The recent decision at Dunblane should convince them that the salmon-fry have no legal protection, unless during the brief period when they assume their silvery lamination, and are known as smolts. If, as there is every reason for believing, they are really young sal-

mon when exhibiting the characteristic colour and marking of the parr, it is manifest that they should be treated by law as "of the salmon kind" during the whole of their existence. In applying for an enactment embodying a provision to this effect, it will be necessary to show that the little fish heretofore termed parr are truly the young of the salmon. The proof of this assertion cannot now be difficult to find. As for those who maintain that there is a fish greatly resembling salmon-fry in the parr state, yet of a different species, and properly denominated parr-trout, we do not see why they should object to its receiving legal protection during close-time. If it be considered the people's fish, to capture which they have an imprescriptible right derived from inveterate use and wont, surely this right should be exercised within reasonable limits. For reasons of public economy, all sorts of game receive a certain amount of protection in order that, without molestation, they may propagate their species. By parity of reasoning we claim protection for this fish, even though it be nothing but a parr, and much more if it be indeed the young of a fish so valuable as the salmon.

In order to help all whom it may concern in forming an opinion as to whether the parr be a distinct species of fish, we have been at pains in investigating what has been written about it since Mr Shaw's experiments seemed to demonstrate its identity with salmon-fry.

Volume XIII. of this Journal for 1842-43 contains "Remarks on the Salmon;" and in these we find the following note: "It is to be regretted that Mr Yarrell, one of the greatest modern authorities in ichthyological subjects, has not given his opinion on what may be called the parr question in a more definite and satisfactory form. In the last edition of his work he gives the history of the salmon nearly as it appears in works of old date, and then extracts Mr Shaw's paper, without attempting to reconcile certain discrepancies, or assist his reader in coming to a satisfactory conclusion." In 1852 we find Mr Young of Invershin intimating an intention of sending "a small full-grown fish, called the parr," to Mr Yarrell,* which seems to imply that this gentleman was still in search of information regarding the species of the parr.

Mr Swainson's opinion on this point is thus alluded to in the vol[illegible] his Journal already referred to: "The comparatively [illegible] mity of the pectoral fin, to which Mr Swa[illegible] [illegible] portance as a proof of the specific [illegible] characteristic of the young of all the [illegible] [illegible] her, then, from Mr Yarrell nor Mr [illegible] [illegible] at rest the parr

[illegible] Knox p. [illegible]

In other quarters we have found positive statements deserving consideration. Mr Young, of Invershin, whose great knowledge of "fish of the salmon kind" is unquestionable, thus writes to Dr Knox, 9th August 1852:—"The greatest distinguishing mark between the two (*i. e.* salmon-fry and parr) is, that the parr has fins in proportion to the fish, while the salmon-fry have fins uncommonly large for the size of the fish. The parr is to be found in salmon rivers, and also in rivers where salmon have no access. They were to be seen in hundreds in the rivers that run into and feed Loch Shin previous to the time that we planted these rivers with salmon; and until we did that, there never was a salmon seen in these rivers; but now they go there yearly, and the salmon-fry and parr are both to be seen in the rivers. There is now only the little river Grudy, that runs into the river Shin, where salmon have never passed a fall on that river, and where parr are yet above that fall." Upon one part of this statement we observe, that the fact of salmon *never being seen* in the confluents of Loch Shin is not enough to prove that these have never been visited by salmon; so that the presence of parr in these rivers may be due to the unnoticed presence of salmon. Lowe, in his *Fauna Orcadensis*, notes the somewhat similar circumstance, that the salmon is so rare in Orkney that its occurrence is looked upon as a wonder, while the parr is pretty frequent in the shallower lakes and clear burns. As to other parts of Mr Young's statement, we quote the opinion of his correspondent, Dr Knox:—"Mr Young considers the parr as a distinct species of trout. The objections to this view are solid and innumerable." "My esteemed friend, Mr Young, of Invershin, informs me by letter, that parr are found in certain streams into which neither salmon nor salmon-trout ever penetrated. Notwithstanding so high authority—the best, I believe—I must venture still to doubt. The parr he means must be the parr-trout, which I have often seen mistaken for parr by good and experienced anglers. It seems to me that Nature herself has settled this part of the question by an experiment she has made on a great scale. Below the Falls of Stone Byres, on the Clyde, parr abounds in incredible numbers, at least in autumn; above the Falls, trace the river to its source, you never will take a single parr. It is the same, I believe, everywhere else; interrupt the course of the salmon, and with it the parr disappears." After this statement, thundered into their unwilling ears by the Falls of the Clyde, we hope that even the anglers of Dunblane will allow that the parr is "of the salmon kind."

The plates in *The Book of the Salmon*, in illustration of the different aspects of the young salmon, are exquisitely faithful; and had they been accompanied by an equally striking delineation of the adult parr, we should have been able to judge of the correctness of Mr Young's belief as to its being a distinct species. The

non-appearance of this plate is thus explained by "Ephemera:"—"I regret that, owing to the season of the year at which I made my application, I could not get a specimen of the parr, to have it engraved and coloured, and placed side by side with the salmon-fry. In answer to my application made from London in November last (1849) to Mr Young at Invershin, he wrote:—'The parr you want cannot be got at this season, in consequence of the flooded state of the waters; but from the description I will give, the artist can easily engrave it.' (I did not think so, and therefore no artist was asked to make the attempt.) A full-grown parr is the length of a salmon-fry of nine months old, and its fins are little more than half the size of those of the fry. It is fuller and darker in the body, and in form like that of a well-shaped common trout. Its cross-bars, or finger-marks, as they are frequently called, lie closer together on the body than the transverse bars do on that of the salmon-fry."

We shall anxiously look for a plate of the parr supposed to be of a species different from the salmon; but we pray Mr Young to imitate the conscientiousness of "Ephemera," and to give us something more to be depended upon than a sketch from description merely. As to Dr Knox's own opinion regarding the parr, it appears to be that "the parr belong to no peculiar species of fish, but a hybrid of several sorts; that the word parr is, in fact, a generic term for the young of several species of the salmonidæ, of which some are regular and constant, others irregular and hybrid." * And this most unsatisfactory surmise is the result of his "contributions to the natural history of the parr."

We must protest against the accuracy of the following statement by Dr Knox:—"It is worthy of remark that no direct experiments have ever been made proving the parr to be a salmon. These would require to be made with great care, and frequently repeated; for the accidental or occasional growth of a male or female parr to a salmon size, no more proves the parr to be a true salmon than a similar occurrence taking place in the mule would prove that animal to be a horse." We aver that such experiments as are thus desiderated have been repeatedly made, year after year, and that the mere salmon-like size of the fish reared at Stormontfield [illegible] point which decisively proves that parr [illegible] The little fish there reared have exhib[illegible] months the characteristic markings [illegible] assumed the silvery scales of the smo[illegible] Returning in about six weeks, of [illegible] grilse; some of these being [illegible] and next year were recaptured as salmon. [illegible] their peculiarities,

as well as the epicures who feasted on them, were all in a mistake, and saw and tasted only a bastard nondescript, is as incredible as that Dr Knox, with all his well-known anatomical lore, cannot distinguish between the Hottentot Venus and the Venus *de Medici.* The nearest approach to a demonstration of the identity of parr with salmon-fry is found in the fact, that both of them exhibit that phenomenon which, in regard to the parr, Dr Knox describes "as most remarkable, and without any example in zoology,"—viz. that "many of the males of these dubious fish have the milt exceedingly developed; the roe in the female remaining uniformly, and without any exception, at its *minimum.*" He asserts, it is true, that "the parr shows the milt developed at seasons of the year in which no salmon is ever found with these organs progressing towards a fecundating condition." We are in a position to prove that this is incorrect. From frequent visits to Stormontfield, from oral and written communications, we confidently state that the male parr in the rearing-pond are full of milt at the same time that the male parr in the neighbouring river are in the same anomalous condition; the roe in the females in the pond and in the river being at the same time in a rudimentary state. This curious fact is also expressly recorded in Mr Ashworth's communication to the British Association, already referred to.

Upon the whole, then, we think all the evidence we have been able to adduce is adverse to the existence of parr as a separate species; and therefore, until the production of a gravid female parr, we are entitled to maintain that there is no such species. We never saw female parr in such a condition, nor have we ever met with any one who saw it; and, though offering a high reward for it, Mr Ffennell, of the Irish Board of Fishings, writes to us that he has not been able to procure it. Consequently the salmon-fishing proprietors of the Tay, pointing to their experiments in pisciculture, may reasonably expect to succeed, when in their new Fishing Bill they crave permission for the insertion of a clause enacting that parr shall receive the same protection as "other fish of the salmon kind."

We embrace this opportunity of suggesting certain improvements in this bill. The closing of the fishings on the 26th August, instead of 15th September, as proposed in the Bill, we should regard with the highest satisfaction, were it not accompanied by a clause authorising rod-fishing, by any person having a written permission from a salmon-fishing proprietor or his factor, up to the 1st of October. This is by way of giving the upper proprietors of the Tay an interest in the preservation of the salmon. For them to preserve spawning beds, the fish produced in which are so sure to be almost wholly intercepted on their return, is no doubt tantalising. But if an attempt be made in some degree to equalise the chance of capture throughout the course of the river, we think

this object should be attempted by ceasing to ply the nets at mid-day on a certain number of Saturdays (say for eight) previous to 26th August. After that date the fish are confessedly in need of protection; and to permit them to be taken by the rod for more than a month afterwards, is alike cruel and impolitic. Subsequent to that date the net, in the greater part of the river, secures but few of the fish, because they are mostly in pools and streams inaccessible by the net. Great numbers of them are certain to be taken by the rod, and every gravid fish then captured is an incalculable injury to the early spring-fishing, the promotion of which is of paramount importance. Gentlemen, during the end of August and throughout September, are generally too much occupied with grouse and partridge shooting to care much about salmon-fishing. They are, moreover, much from home at that season; so that the fishing will be little under their personal observation, and consequently will be eagerly prosecuted by those fishing for the pot, or by those anxious to fall in with gravid fish, in order that they may get a supply of roe, to be used as bait by the unscrupulous poacher.

According to our plan, the upper part of the river would, for a certain number of weeks, receive a supply of fish in a healthy condition, and so afford legitimate sport to those dwelling on its banks; while the lower fishings would benefit immensely by the early spawners being enabled to begin their operations at the natural period. A river stocked by late spawners is in a position as unfavourable to the successful prosecution of salmon-fishing as can well be conceived.

Moreover, the new bill should do something more than protect parr and parturient salmon; it ought to have exterminating powers against certain enemies of the fish in the sea and the estuary. What does it avail to punish poachers, if porpoises and seals are allowed to revel unmolested upon the choicest of the salmon, and to slay them to an amount exceeding computation? The shield of the law may be thrown around the tiny parr, and the spawning-beds may [illegible] watched, but the chief benefit will be to the nim[illegible] the greedy porpoise, unless these [illegible]otour salmonic[illegible] [illegible]cilessly slain. We are confident that more good [illegible] [illegible]ning will thence accrue than from the wisdom of [illegible] science of pisciculture. The name of these [illegible] region. In the Tay they are particular[illegible] [illegible] of Dundee, and along the whole [illegible] the porpoise in chase of the salmon, [illegible] only landed it in the gaping [illegible] matter to count the seals, not [illegible] shooting them. When gorged with food, [illegible] but not without the precaution of [illegible] slightest alarm rouse the sleepers,

and in an instant the whole are out at sea. As to their size, we find a witness before a Parliamentary Committee comparing it to that of "a twa-year-auld stot." Mr Halliday accuses them, before the same committee, of being salmon-slayers to an extent which made him fear that they would take the fishing from us altogether. Irritated by the special impudence of a seal which he saw rob his stake-nets of six salmon in less than three hours, this wrathful fisherman tried to harpoon the thief, and vainly flattered himself that he had him safe one day when he was so rash as bite at a salmon in which were two large hooks. "Afterwards," observes the discomfited fisherman, "I was standing on the stake-net, with one foot on one side of the door, and one on the other, watching the seal, when he came and chased a salmon through between my legs, and wheeled about and went away again, without my being able to touch him!" Mr Campbell, salmon-fisher, Stonehaven, was recently more successful in a device against the enemy. Mixing up ten drachms of strychnine in hog's lard, he inserted the mixture into the side of a salmon, which he fastened to the stake-net. Next day, salmon and seal had disappeared. Three days after, the seal was cast ashore dead near Dunnottar Castle. Not till two years ago have we heard of more than desultory attempts to arrest this wholesale destruction of the salmon by capturing the seals, the inducement apparently being the value of their oil rather than an enlightened desire to protect valuable fishings. We then had the gratification of perusing the following paragraph:—

"*Seal-Fishing at Home.*—A sloop is being fitted up for a party of gentlemen, including two sons of Colonel Baillie of Redcastle, who are to proceed for the capture of seals near Tain, in the Dornoch Firth. The same vessel last season, with the same party, in five weeks captured and killed no fewer than 153 full-grown seals."*

Mr Halliday is confident that a seal captures six or eight salmon per day; so that this anti-phocal expedition must have greatly benefited the salmon-fisheries in the Dornoch Firth.

As to the porpoises, their worthlessness for any purpose save for being converted into manure should not exempt them from destruction. One witness is confident that he has seen at one time two hundred of them in the mouth of the Tay, and that they and the seals destroy more salmon than were ever caught in the Tay in any one season! From the stomach of a porpoise six salmon have been taken, some of them so little injured as to be sold in the Carlisle market.

When parrs are protected—when porpoises and seals are pitilessly persecuted—when pisciculture is assiduously prosecuted—when parents whip *their* young fry for catching in May hundreds

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* *Scotsman*, 13th September 1855.

of smolts which in two months would have grown into grilses of an average weight of five pounds—we may reasonably expect a return of the good old times when salmon were plentiful. But, as time is required for the realisation of these hopes, let us meanwhile solace ourselves contemplating this vision of a salmon feast with which Mr Stoddart concludes his admirable *Companion to the Rivers and Lochs of Scotland*:—"Slayer of salmon! what sound, when thy reel is at rest, like the bubbling and the frothing of the fish-kettle?—what fare more acceptable than the shoulder-cut, snowed over with the curd of a gallant sixteen-pounder?—and where, in the wide world, is to be found wholesomer and heartier sauce than a goblet, generously mixed, of Islay, and piping hot? Stretch thy hand over thy mercies, and be thankful."

E.

P.S.—Our attention has been directed to certain recent letters in the *Times* touching the Parr question. Dr Esdaile observes:—"It is not more certain that boys and girls are the young of the human species, than that penks, parrs, and samlets (as they are indifferently called) are the young fry of the salmon, which pass the first year of their life at least in their native streams. The conduct of salmon-fishing proprietors in permitting the destruction of parr is as rational as high farming, with the help of tile-drains, liquid manure, and steam power would be for the purpose of eating corn in the blade."

Mr Ayrton, honorary secretary to the "River Dee Fishing Association," communicates the results of measures for the protection of the salmon in that river. These are so like those we have recommended, that we give a portion of this communication:—"The landed proprietors over about twenty miles of the river, and where the fry were most taken, have agreed to close the river adjoining their properties from all fishing with the rod, except by ticket, and from all netting whatever. Any person wilfully taking salmon-fry, or offering them for sale, is for the future debarred from fishing in the preserve on any terms. But the most important rule of all is, that the preserve is closed entirely, both to rod and net, from the 31st October to the 25th March, and constantly watched, so that the fish are left (as partridges and pheasants are left) quietly to breed during the breeding season. This plan has been in operation over about ten miles of the river for about five years, and the increase in abundance of fish is scarcely credible." Mr Ayrton adds, that "the only chance of retaining what we have no occasion whatever to throw away—the breed of salmon in our English rivers—is a reformed fishery code, a salmon reform bill, with an extension of the franchise to all the young fry." We shall certainly not vote for our county member if opposed to the said bill! E.

THE TOWN-SEWAGE QUESTION.—NO. I.

There are some questions which, although of great importance to the community at large, are destined to receive, in place of well-sustained and well-directed endeavours which rapidly place the matter in a settled position, spasmodic efforts only of support, and an agitation in their favour which comes at intervals few and far between. After a long period of silence, when the subject seems to have been consigned for ever to oblivion, or the stage at which it was left at the last discussion to have been accepted as its final settlement, some cause or other, trifling, perhaps, in itself, brings the whole again before the public, invested with even greater importance, and presenting claims to notice more pressing in their nature than before. Meetings are held, pamphlets published, reports presented, even royal commissions sit, and discussions are entered upon by rival partisans, which are carried on with an accession of vigour and a lack of courtesy equally amusing to one who may happen to be a calm looker-on, unbiassed either by prejudice or interest. As the agitation suddenly rises, so it as suddenly falls; a "calm comes over the spirits" of those engaged in the turmoil of the discussion, and the whole matter presents again that aspect of total settlement which it has so often before presented.

Among such questions or subjects of discussion we may class that of the "Disposal of Town-Sewage." Although, viewed in its sanitary as well as in its commercial features, all are agreed as to its importance, it seems to be a task the difficulties of which are apparently insurmountable, to devise a plan of procedure by which the towns on the one hand shall be happily rid of a nuisance and a cause of disease, and on the other the fullest advantage, in an agricultural point of view, be obtained from the materials creating this nuisance, of which they are capable. The features of the discussion of some public questions, already alluded to, distinguish this one of the Town-Sewage as forcibly; and perhaps no question of public importance has suffered so much from this alternate calm and storm of discussion. Some time ago, a somewhat hot and protracted discussion was ended by one of those abrupt lulls which distinguish all questions which are unlucky enough to be carried on by spasmodic agitation. This lull is now about to be succeeded, we think, by another discussion, the results of which, we hope, will be more favourable to real progress than was the last. The immediate cause of this will arise, probably, from the publication of two official reports recently issued, and of the contents of which we purpose to give a *resumé*. These Reports we give the titles of in the order of their publication. 1. "Report on the Means of Deodorising and Utilising the Sewage of Towns, addressed to the Right Honourable the Presi-

dent of the Board of Health, by Henry Austin, C.E., Chief Superintending Inspector of the Board." 2. "Report on Metropolitan Drainage." This last Report had its origin in a letter of the First Commissioner of Her Majesty's Works to Captain Galton, R.E., James Simpson, Esq., C.E., and Thomas E. Blackwell, Esq., C.E., directing them to consider the plans for the main drainage of the metropolis, as submitted to the First Commissioner by the Metropolitan Board of Works.

In our article in No. LII. of this Journal ("Our Modern Town-Drainage System, is it Right or Wrong?") we pointed out that the methods which have been proposed for utilising the refuse of our towns in augmenting the fertility of farms, might be divided into two great classes, the "solid" and the "liquid:" the first aiming at a treatment of the liquid sewage by which to obtain its solid particles, these being sold and applied under the same category, and in the same way, as the ordinary "special manures" of commerce; the second, or the "liquid method," consisting, as its name imports, in conveying to, and distributing the sewage over the land. Mr Austin subdivides the first, or "solid" method, into three classes of operations: 1st, The precipitation of the solid matters held in mechanical suspension and partial solution in the water, by the addition to the sewage of various chemical ingredients; 2d, The separation of the solid matters in suspension by straining or filtration, and their admixture with various solid deodorising materials; 3d, Simple deposition and draining-off of the liquid from the solid mass. He in like manner subdivides the "liquid" method into two classes of operation: 1st, The system of open irrigation, which has been practised in some places for many years; 2d, The system of underground pipes, and distribution by movable hose and jet, which has been brought into practice only within the last few years.

In our recent article, "Patent Specifications relating to Manures," we entered so fully into a description of the peculiarities of the methods proposed to obtain solid manure from sewage, that we are here spared the necessity of devoting further space to a consideration of the first two of the three subdivisions of the solid method as above stated. We think it right, however, in corroboration of the views repeatedly enforced in this Journal, as to the inapplicability of these methods to the purposes of agriculture, to give here the results of the investigations of Professor Hoffmann and Mr Witt of the Museum of Practical Geology, on the "Manufacture of a Manure from Sewage," by the following processes:* (A) Treatment of sewage with lime; (B) Treatment of sewage with a mixture of lime, sulphate of ammonia, and charcoal (Stothert and Gotto's process); (C) Treatment of sewage with charcoal (Jasper

* This is given as an Appendix to the Report on Metropolitan Sewage.

Rogers' and Richard Dover's process)—1. Filtration of sewage through charcoal; 2. Agitation of sewage with charcoal: (D) Treatment of sewage with a magnesian salt (Sir James Murray's process). With reference to the processes (B) and (C 1), the experimenters found that in one (B), the cost of the materials employed nearly equalled the money value of the manure obtained; while in process (C 1) the cost of the materials very considerably exceeded the value of the manure: again, that in process (D) the manure obtained, consisting of the suspended matter, might be as easily obtained by simple subsidence as by the use of the material suggested. With reference to the processes (A) and (C 2) the experimenters make the following report: "We find from our experiments, made on a small scale, that the value of the manure produced considerably exceeds the cost of the materials employed. However, on going minutely into all the conditions involved in the manufacture of a manure from the London sewage by the two processes above mentioned, we come to the conclusion that they offer no chance as commercial speculations. We have been led to this conclusion by considerations, among which the following are the more important: (1.) In estimating the commercial prospects of a process, it is safer to rely upon the results obtained in a manufacturing operation, than on those furnished by experiments on a smaller scale. Now, analysis shows that the value of the article manufactured at the works at Leicester,* where the liming process is adopted, is less than one-half of the value which experiment assigns to our manure obtained on a small scale. (2.) In calculating the probable expense of manufacturing the sewage manure, the interest of the capital required for the erection of works, the actual cost of producing, and the commercial expenditure, we have but insufficient data, and they have therefore probably been estimated below what would be found to be the case in practice. All these circumstances prove that the profit resulting from the manufacture of sewage manure would be reduced to a very small amount. (3.) The nature of the manure manufactured by either of these processes—its great bulk, containing as it does but a very small quantity of valuable constituents in a very large mass of inert matter—increases the cost of carriage, and spreading, when compared with that of guano, to such an extent as to limit its application to a very small area. With reference to the liming process, for instance, taking the value of the Leicester bricks as representing the average value of the lime-manure, and starting from the calculation of the manufacturing expenses chiefly furnished by the estimate of Mr Wicksteed the patentee, we find that the profit on a ton of lime-manure sold at the works would be 5s. 3d., whilst at a

* The "lime process" is carried out at Leicester on a very large scale by a public company, working under Mr Wicksteed's patent. £30,000, it is said, have been expended upon the works.

distance of only two miles from the works it would not realise more than 2s. 3d. profit; and when transported to a distance of five miles, the manure would have to be sold at a loss." Taking, then, the result of all the investigations which have been made from time to time on the value of solid manure obtained from sewage, we are forced to the conclusion that the "solid method" has little or no chance of commercial success. But further than this, it appears from the investigations of Messrs Hoffmann and Watt, that the processes (A), (B), (C 1), and (C 2), which have already been under notice, do not, as has always been understood, meet all the sanitary requirements of the case. For although, as methods for "deodorising and consolidating sewage into a manure," they fulfil "to a certain extent the office for which they were proposed," still, "at the same time, it is found that these several processes leave a large quantity of putrescible organic matter in solution, which, especially in hot weather, is apt to undergo decomposition, and to give rise to effluvia of the most offensive and dangerous character;" and, continue the reporters, "we believe that the erection of works in the immediate neighbourhood of the metropolis, for the deodorisation of London sewage, might prove very prejudicial to the health and comfort of the inhabitants of London; and that, in the event of the establishment of such works, the fluid run off from the sewage-deposit, if discharged into the Thames in the vicinity of London, might very seriously affect the river."

On the third subdivision of the solid method adopted by Mr Austin, namely, the "simple deposition and draining off of the liquid from the solid mass," we have to offer a few remarks. It will be remembered, in the article already alluded to (No. LII.), that attention was drawn at considerable length to the new views as to the disposal of the town sewage advocated by some, namely, that we do wrong in mixing the excrementitious and refuse matter of our houses with water, for the purpose of acting as a vehicle for carrying it off through the medium of a ramification of pipes and sewers, to the ultimate destruction of our rivers; the right way, as the holders of these new views say, being to store all matter up at the place where created, reducing its value as little as possible by carefully avoiding a too great admixture of water; and, by the use of potent chemicals, preventing the accumulation of noxious gases and fœtid smells. By treating the house-refuse in this way, and by adopting appropriate and well-devised arrangements for removal, the advocates of this new system hold that it would have a high value as a manure, which would well repay the cost of its removal to the agricultural districts. In answer to these views, which are simply a modification of the Parisian system of cesspools, Mr Austin has the following: "I fear that all such objectors who would revert to the cesspool system, view the subject with agricultural or commercial sympathies, rather

than with an anxious regard for the public health as the primary consideration; at least they must be ignorant of the overwhelming evidence, which a long course of inquiry has brought to light, of the evils sustained by the retention of town-refuse about habitations. Some will admit these evils, but maintain that they arise from carelessness, and defective arrangements both for the retention and removal. So far as this country is concerned, these defects, whether of construction or transport, must be admitted; but the Paris arrangements are the very perfection of the system. No care or expense has there been spared, and yet it is proverbial that the great source of the noxious atmosphere in Parisian houses is the cesspool. Admitting this danger, even with the best arrangements, some will ask, is not chemistry equal to the control of these substances, either to prevent their passing into a dangerous state, or to convert them into innocuous and valuable fertilisers? Granting this power to chemistry, we must bear in mind that any arrangement made with this view must receive daily proper attention in every separate household; and, supposing this to be given, the cost of the necessary arrangements and collection would exceed the difference of value between the refuse in this more solid form, and that in which it is presented at the outfall diffused in a large body of water."

But, in addition to the large body of water added to house-refuse as the vehicle of its removal, and which tends so much to reduce its fertilising value, we find that this value is still further lowered by an additional volume of water derived from the "rain-fall;" hence the advocacy of the system of separate drainage—drains for the house-refuse and drains for the rain-fall. Mr Austin objects to this separate system on many grounds, and thinks that, although at first sight the difficulty of this increased dilution is so great, and the remedy so simple, still an undue importance has been given to it from a mistaken view of the subject. In the first place, although a certain amount of rain falls annually at a given spot, this is not to be assumed as representing the daily addition of water to be applied to the land, or from which the sewage constituents have to be disengaged; for, in addition to the quantity of the rain-fall taken up by evaporation, it so happens that a very large proportion of the rain falls on a small number of days in the year. The sewage then, on these occasions, being so completely absorbed in an enormous bulk of water, might safely be let off to the outfall, not being used at all for the purposes of irrigation. It is evident that the registered rain-fall in a year at any place is not to be assumed as the amount of water further diluting the sewage. But if the "separate system" is only to be carried out on public, to the exclusion of private property, Mr Austin shows that, from the larger surface taken up by private than by public property, four-fifths of the rain-fall would pass to the private drains, and

only one-fifth to the new or rain-fall drains made on the public property; so that little advantage, comparatively, would arise from the adoption of the system on this footing. But if the difficulty is attempted to be obviated by extending the system alike to private and public property, "where," asks Mr Austin, "is the separation to take place? A complete double system of house-drainage would be necessary. Will the interior of the house be drained to the refuse-sewers, and the exterior to the rain-water sewers? the stable-yard with its dung-pit to the one, the stable itself to the other? or will the waste from the wash-house sink, and that from the accumulation in house-yards of the lowest class, where the scavenger rarely enters, drain their several ways?" But further, it is to be considered that this rain-fall, passing to our drains as now constructed, is not simply a diluting agent; from the street-manure which it will wash down with it, it will in some measure be a fertilising agent. Professor Way found the street-washings of the metropolis comparatively rich in fertilising elements; and Mr Austin mentions that the most overpowering exhalations he has experienced arose from the surface-refuse only, washed into gutters and catch-pits, and this in places where there was no connection whatever with house-drainage. Indeed, this consideration affords Mr Austin his main objection to this "separate system;" for in its adoption he sees the perpetuation of "*two* foul systems of sewers and house-drains instead of one; at the best, two sources of foul atmosphere ramified over every town, and each the more dangerous for that very separation; so that, even if the interests of agriculture loudly demanded this treatment of the case, and the enormous cost were not an object, *regard for the public health would forbid it.*" Again, on the supposition that the establishment of this separate system were possible, so far as the agricultural view of the point is concerned, it would "simply be a question whether it would be cheaper to construct this costly system of complicated works, than to apply the useless rain-water to the land, or to waste the sewage on wet days."

As before noted, Mr Austin divides the "liquid method" into two subdivisions—"open irrigation," and irrigation by underground-pipes, and hose and jet distribution.

Of the open irrigation, the Craigentinny meadows at Edinburgh certainly offer the "most striking and successful example." These have been so often described, and must be so well known to the majority of our readers, that we may pass on to other matter; only noting that Mr Austin, in common with many other observers, is of opinion that the nuisance complained of in connection with the system, arises from the surface of sewage presented by the *open ditches* in which it flows, and not when it is passing over the *land*. He holds that the sewage should not be left open to the atmosphere till actually passing over the land. But more of this hereafter.

Passing over other well-known examples of open irrigation, as those at Tavistock (the Duke of Bedford's), Clipstone Park (the Duke of Portland's), Pusey Meadows, &c., &c., we here notice the method of irrigation introduced by Mr Bickford of Crediton, and which is at present attracting considerable attention, as affording "a simple yet efficient method of conducting water over lands, whether of even or of undulating surface." In a communication to the *Journal of the Royal Agricultural Society of England*, Sir Stafford Northcote described the peculiarities of the system, from which we derive the following particulars: Along the line of the highest ground a carriage-gutter is cut, about 12 inches broad and 6 deep, these gradually diminishing as the gutter approaches its termination, till at last it merges into the ground. On this gutter becoming filled, the water overflows; and were the slope of the land below uniform over all its surface, it would be shed uniformly over it; but the inequalities in the land prevent this, causing it to flow in streams over the lowest parts. To obviate this, subsidiary or smaller gutters are cut in the same direction as the main carrier-gutter, but level throughout their whole length. The water shed from the carriage-gutter is caught by the subsidiary one till it fills, and in turn overflows, shedding the water over the land between it and the next subsidiary gutter in succession; this having, as the other one, no fall throughout its length, also fills, and in turn overflows, shedding the water over the land between it and the next gutter; this is continued till the water finally reaches the drain at the bottom of the field. The method by which these catch-waters or subsidiary gutters are formed level throughout their length, or nearly so, forms, from its simplicity and effectiveness, the peculiar feature of Mr Bickford's system. In laying these catches out, the spirit-level is set aside, and a simple instrument substituted. Two rods are joined at one end, and fixed at an angle so as to place the feet 4 feet apart; between these a cross-piece is fixed, with its centre marked by a notch; from the apex of the triangle is hung a cord, from which a ball is suspended. When the instrument is placed on the ground, and the cord crosses the notch in the cross-piece, the two feet stand on the same level. The workman places one foot of the instrument on the ground, and on this, as a pivot, turns the instrument round as he would turn a pair of compasses, and continues to place and replace the other leg, until he finds that both stand on the same level. Marking the position which the first or pivot leg occupied, he uses the second leg as the next pivot, and proceeds as before, until he finds a spot on which the other leg resting, places both legs on the same level. Obtaining thus a series of markings, he by this means traces out a level line throughout the field, and finally, by means of a plough invented for the purpose, cuts out on the line thus indicated a gutter 4 inches wide, and the same number of inches deep. At points where it is impossible to

obtain a level, a stop is put in the gutter, and a fresh level taken for the continuation. On the supposition that the water employed for irrigation contains fertilising matter in suspension, it is evident that, in the plan just described, the upper part would receive the most of this matter, the second a less portion, and the third the least; to obviate this difficulty, cross-feeders are made, connecting the main gutter with the subsidiary one below it, and this with the succeeding gutter, and so on. By a simple system of stops, the water from the main source can be passed to any one of the gutters without being shed over the intervening land. Sir Stafford Northcote estimates that the cost of irrigating land similar to his own, where the system has been carried out, would be not exceeding £1 per acre, the annual expense of cutting new gutters by the side of the old ones being 1s. per acre.

In many farms—and their number is decidedly increasing—liquid manure is conveyed to the ground through the agency of underground pipes, and distributed over any desired surface by means of hose and jet. The liquid manure is forced through these pipes either by gravitation or by pressure from pumps worked by steam or by horse power; upon the pipes hydrants are fixed at convenient distances, to which the hose-pipe with jet is attached.

An objection on the score of expense has been raised to this system, when put down for the application of liquid sewage. This objection will be found in a detailed form in the article in No. LII. of this Journal. In answer to it, Mr Austin notes that "the laying down of the distributing apparatus is of itself an excellent investment, from the facility afforded for conveying manures cheaply to the land whenever or wherever required, or for washing in solid manures. This experience is wholly irrespective of the advantage of the application of sewage; but it has an important relation to it in lessening the risk, which might otherwise be run, of providing expensive apparatus usefully applicable to this purpose alone."

Originally designed to facilitate the application of farmyard manure to land, this underground pipe and hose and jet system has [illegible]ntly been made a[illegible]ilable in the application of liquid town-sewage [illegible] the state in whic[illegible] [illegible]ns from the outfall. The most "important and comp[illegible] [illegible]le" of this mode of applying town-sewage [illegible] with at Rugby, where arrangements [illegible] [illegible]lker of Newbold Range to use the [illegible] [illegible]lts of this trial have given rise to [illegible] opposite opinions are advanced, we [illegible] peculiarities of the system likely to [illegible] interest to our readers.

[illegible]ion of Rugby is stated to be 7000, the quantity of [illegible] per day being estimated at 160,000 gallons. Most [illegible] have been provided to carry all the sewage to the [illegible] humblest

dwellings provided with water-closets. The original outfall for the drainage was into the river Avon, but it is now into an open brick reservoir situated on Mr Walker's land. The depth of the reservoir is 12 feet, the diameter being 50 feet. A steam-engine of 12-horse power forces, by means of a pump 12 inches diameter and 2-feet stroke, the sewage into and through the system of cast-iron pipes distributed over the farm. The greatest elevation to which the engine is required to pump the sewage above the level of the reservoir is 60 feet; but a considerable portion of the land is only 20 feet above, while some of it is 20 feet below the level. To keep the sewage in agitation within the reservoir, and prevent the deposition of the solid matters held in suspension, the engine works a small air-pump, the current from which is led to any part of the reservoir where agitation is required, through a gutta-percha tube or pipe one inch and a half in diameter.

The distributing pipes extend to a length of 5½ miles, and are laid over 470 acres, chiefly under grass: this gives a proportion of pipe of 20 yards to the acre. The rising branch or main is 6 inches diameter; all the branches are 3 inches diameter. Throughout the length of pipes hydrants or cocks are laid at intervals, the distances between which are varied according to the requirements of the land. These hydrants are 66 in number, and afford junctions to which lengths of gutta-percha tubing are attached wherever the sewage is required to be distributed over the land in immediate connection with the hydrant. Mr Walker at the first employed the ball-valve hydrants generally used at water-works. As the solid matter passing through the pipes frequently choked the valves, and prevented them from closing, he substituted for the hydrants vertical junction-pipes, providing the aperture of each with a simple flat cover, secured to the flange of the vertical junction-pipe with two nuts, a gutta-percha ring being placed between the curve and the flange of the pipe. The extremity of the gutta-percha hose is provided with a mouthpiece, which fits on to the aperture of the junction-pipe, the cap being removed when the liquid is required to be passed through the hose. The length of the gutta-percha hose employed is 140 yards, the diameter being 2¾ inches; to the end of this, two lengths, each 100 yards long, of 1½-inch gutta-percha pipe, are attached for distribution. The large pipe is made up in lengths of 20 yards each, these being secured together by screw-caps. Five or six of the 1½-inch distributing pipes are in constant use.

The cost of the works has been nearly £3000, averaging £6, 7s. per acre. Mr Walker, however, thinks that, with the experience now gained, very complete works might be established at a cost of £5 per acre; at the same time, he would not advise the same quantity of sewage to be distributed over so great an area of land, a concentration in a less extent of land being more economical.

The cost of distribution, including interest on outlay, rent of sewage (£50 per annum), coals, labour, and all expenses, amounts to £1 per acre. Mr Austin estimates the permanent increase on the value of the land obtained by the use of the liquid sewage, in the manner above described, at £1 per acre.

Comparing the comparatively small increase in the value of land obtained by the use of liquid sewage applied by pipes and hose, as at Rugby, and other places which we have not alluded to, with the amazingly large increase obtained by the use of sewage, as exemplified at Craigentinny near Edinburgh, Mr Austin is led to inquire the cause of the enormous difference in value. This, he thinks, arises "simply from the fact that, in the latter case, the continuous application of the sewage is reduced to a system by which immense quantities of manure are judiciously put upon the land; while in the other cases very inadequate quantities are injudiciously given by intermittent application, without system." After glancing at the "extraordinary results" of the system carried on at Craigentinny, Mr Austin thus continues: "Does it not naturally suggest itself, in seeking the means of disposing of town-sewage generally to the best advantage, that they should be such as to allow of the application of the whole quantity upon a minimum space, on which the vegetation can assimilate it without waste, rather than upon a wider area, at an increase of cost, and with a decrease of fertility?" Arriving at this conclusion, and taking it as the basis of an improved practice, Mr Austin proceeds to give his "recommendation," by which this practice can be carried out. The main features of the plan of operation proposed by Mr Austin are—first, the removal of much of the offensive portion of the sewage, by which a solid manure may be obtained, and this irrespective altogether of its value; and, second, the application of the liquid sewage—thus comparatively purified—in large quantities, through the agency of a system combining the advantages of underground mains with gutters carried out on Mr Bickford's plan, as already described.

The method recommended by Mr Austin, by which to deprive the sewage of its most offensive portion, and to obtain a solid manure is that ad[illegible] Cheltenham—a notice of which we now give [illegible] the out[illegible] [illegible]rainage a building is erected, and [illegible] below ground two sets of [illegible] alternately. Two angular [illegible] anks, and the sewage, [illegible] bulk of the matter held in [illegible] deep and 2 feet thick, and are [illegible] within the space, formed by [illegible] This boarding is perforated with small [illegible] from clogging up by basket-work [illegible] deposit themselves at [illegible] solid matter

forms itself into a floating body, and accumulates to a thickness of about 18 inches. The liquid is conveyed from the angular filters in the upper tanks by a line of pipes. The liquid, partially clear, passes to the liming tank, in which a division is placed; this causes the liquid to flow through a channel at each end. During the flow it is mixed with a certain proportion of cream of lime, which is made to fall from the floor above. This mixture causes a further precipitation to take place. The liquid then passes through a second filter, with finer gravel than the first, and from thence to a third filter, with still finer gravel, and finally to the outfall. When either tank contains a certain amount of solid matter, the flow of sewage into it is cut off, and turned into the other. This is required to be done every fortnight, and affords an opportunity to clear the filtering medium—the gravel—which is taken out and washed. The contents of the tank, in a state of slush, are hoisted in buckets to the floor above, through trapdoors placed at intervals in the flooring. It is then wheeled out, and mixed with the scavenger's refuse of the town-ashes, street-sweepings, &c. &c., the quantity of which collected in the town seems to be sufficient to mix with the "slush" obtained from its sewage. As soon as this is absorbed, and the mixture incorporated, the mass is fit for removal and use. The ashes absorb two-thirds of their bulk of sewage, so that a cubic yard only results from the mixture of two-thirds of a cubic yard. The number of houses draining to the tanks is 3200, yielding about 300,000 gallons in twelve hours. The ashes cost about 8d. per yard, and the cost of the operation of filtering about 2s. 2d. per cubic yard of manure. The selling price adopted by the local board was 2s. 6d. per yard; but as the demand exceeded the supply, it was intended, at the period of Mr Austin's visit, to raise the price. A charge of 3s. 6d. per yard would clear the working expenses and interest on the outlay. Mr Austin proposes certain modifications of this plan, which space does not allow us to notice here, by which a more complete separation of the solid particles from the liquid may be effected.

Granting that the sanitary requirements of the question are met by this plan of arresting the solid and more offensive matter of the sewage, and obtaining a solid manure of some value, the agricultural requirements remain still to be met. "The water is robbed but of little fertilising power by the removal of the solid matter. It will still contain in solution all the most valuable properties, and those, in the present state of knowledge on the subject, can practically only be made available by the application of the water itself to the land." Mr Austin admits that in many towns the circumstances of the surrounding district forbid this application, but holds that, in the majority of cases, there is no insurmountable obstacle to it; and that the "evidence clearly points out that, if only proper means be adopted for this application, and for dis-

posal of the produce, very great advantages may be expected from its use." Being of opinion that the large amount of liquid required for successful operation cannot be got on the land conveniently through the agency of the hose and jet, Mr Austin proposes, as we have already stated, to apply the "liquid sewage, *after the separation of the solid matter*, by a combination of underground mains with Bickford's system of contour gutters. The quantity which could by this method be delivered at a certain spot, and distributed over a given area, would be limited only by the size of the pipes, and the pressure applied therein by gravitation or by engine-power. By opening valves placed at convenient points, the pipes would deliver into small troughs, whence the sewage would discharge into the top gutters, and thence into cross-feeders, as required; and with the same sized mains one lad would superintend the distribution of many times the quantity that it is practicable to get on the land by means of the usual small subsidiary pipes and hose and jet." To obviate all objection on sanitary grounds, Mr Austin insists on the necessity of previously draining the land before applying the sewage, unless the soil be of a very porous nature, so that no stagnant water will remain on the surface. "Unless this can be secured," he says, "malaria can hardly fail to follow; but I must repeat that the well-founded complaints at Edinburgh arise from the great extent of evaporating surface in the ditches. In the plan proposed there will be no ditches; no land either wastefully or mischievously occupied; no stagnant surface of water; no foul deposit. The main pipes will be the substitutes for the large Edinburgh ditches; the solid matter will be separated before irrigation; and the liquid will be absorbed by the earth, nature's grand deodoriser, as fast as it is exposed."

Mr Austin's views are greatly supported by the conclusions arrived at by Messrs Hoffmann and Witt, given in the Report on Metropolitan Drainage; first, as to the comparative value of the solid manure obtained by the various processes for deodorising, and of the liquid which remains after the process is carried out; on this point they give the following suggestive table of the agricultural value of the insoluble and soluble constituents in 100 tons of sewage:—

	In its original State.	After treatment with Lime.	After treatment with Stothert and Gotto's Mixture.	After filtration through Charcoal.	After shaking with Charcoal.
Valuable insoluble matter	2s. 3½d.	nil.	nil.	nil.	nil.
„ soluble matter....	15 4½	11s. 11d.	12s. 5d.	11s. 1½d.	10s. 11½d.
Total	17 7	11 11	12 5	11 1½	10 11½

... obvious that six-sevenths of all the

fertilising constituents of sewage are in the soluble form, and that in the liquid which results from the deodorising processes, by means of lime and charcoal, a very considerable proportion of the soluble agents of the original sewage remain unremoved. In the presence of such facts, the question naturally suggests itself, is it possible to apply the valuable constituents of the sewage in their original liquid condition to the land? . . . The success of irrigation involves, however, one condition—namely, that of employing very large quantities. This will be intelligible by a glance at the table given above, which shows the degree of dilution, expressed in shillings and pence, in which the valuable constituents exist in sewage-water. If it be remembered that to impart to a meadow the fertilising power of one ton of guano it is necessary to apply 1250 tons, or 310,000 gallons of sewage-water, the necessity of employing a constant and ample supply requires no further comment; and, in fact, wherever remarkable results have been achieved by sewage irrigation, it has always been by the use of enormous quantities." And after giving sundry remarks on the probabilities of the transmission of the sewage to country districts for irrigation purposes, paying the working expenses, and interest for outlay, they thus conclude: "However imperfect and unsatisfactory may be the state in which we have to leave the question, we feel no hesitation in expressing our opinion, that of all the schemes proposed for the utilisation of the sewage of London with which we have become acquainted, the proposal of using it for the purpose of irrigation is *the one which appears to us to be the most promising;* and we would even go a step further, and say, that it appears to us the *only one that has a moderate chance of success as a commercial undertaking.* In the liquid portion of the sewage we have six-sevenths of the whole of the constituents valuable in agriculture; they are present in the form most appropriate for offering them to the roots of plants. They there exist ready for use, without the necessity for the performance of any manufacturing operation. It is true, they are in a very bulky form, but nevertheless in a form which physically admits of the cheapest carriage. The question that remains is, what would be the cost of carriage?"

Mr Austin's views are further supported by Dr Gilbert, well known in the agricultural world for his experiments on fertilising agents, carried on in conjunction with Mr J. B. Lawes. In a paper by this gentleman addressed to the referees appointed to report on the metropolitan drainage, amongst other suggestive remarks, to which we may hereafter refer, he offers several on the best methods of dealing with the sewage, considered in a sanitary as well as in a productive and agricultural point of view, and discusses what he conceives to be the most "feasible alternatives." One of these he thus states: "After employing some disinfecting

method, the value of the solid manure and that of the supernatant liquid for the purposes of irrigation, may both be set against the cost of the removal and disinfection for sanitary purposes." On this alternative he remarks: "I think it probable that, owing to the very low character of the solid product obtainable by the lime method (elsewhere stated by Dr Gilbert to be, in his opinion, 'by far the most practicable and effective on the large scale'), a considerable portion of it would have to be got rid of in some other way than as a manure, whilst the remainder would command a very low price, and its use would be confined within a very limited range of carriage. The advantages of the plan, in a remunerative point of view, would therefore chiefly depend on the return from the use of the clarified liquid for the purposes of irrigation. This clarified liquid would no doubt enormously increase the growth, particularly of grasses, to which it might be applied; but its effects would as certainly be less than before the removal of the solid matters, which, when separated, have in themselves so little money-value. The chief point to decide, therefore, would be, whether, provided irrigation be adopted, there would be sufficient sanitary advantages to set against the increased cost in dealing with a disinfected rather than with a crude sewage for that purpose." This alternative Dr Gilbert believes to deserve "a thorough experimental examination."

The more the question of the disposal of our town-sewage is discussed, the more fully do the results of the discussion tend to confirm that view—now gradually gaining ground—which we advocated at some length in our last article on the subject; namely, that the sanitary requirements are those which imperatively demand the primary consideration of those immediately concerned in the removal of all matter tending to injure the health of our town population. Getting rid of this avowed cause of annoyance and disease is the simple duty of all town corporations; this, and this only, is their bounden duty. To do this is as much a part of their business in the conservation of public health, as getting rid of any other nuisance which [illegible] it; and it would just be as reasonable to refuse to neg[illegible] it is to neglect the other, because in [illegible] no pecuniary benefit which would go [illegible] of the operation. Town-sewage [illegible]ations is an avowed nuisance, and [illegible] get rid of it? The question, Can [illegible] it? is not, and ought not to be, [illegible] with the first. This last should [illegible] secondar[illegible] if by any means a return can [illegible] our town sewage, good and well; let this, whatever [illegible]ount, be set against the cost of doing what is the main thing [illegible] namely, getting rid of it. But no corporation can be [illegible] refuses to get rid of a

deleterious material, on the ground that what they can obtain for some of its constituents does not pay for the cost of its removal.

We have by no means exhausted the interesting matter in the Reports which we have named at the commencement of our paper; we have yet to notice many points more particularly suggestive to agricultural readers. These we hope to take up within the compass of another article, and this probably in the next Number. R. S. B.

THE AGRICULTURAL STATISTICS OF 1857.

It is not our intention in this paper to enter with the same minuteness upon the Agricultural Statistics of 1857 as in our articles on those of 1855 and 1856. Were we to do so, we might justly be charged with repetition. We prefer rather to apply the facts brought out in last year's Statistics to the general principles laid down in the former articles, thus adducing them as confirmatory of our previous statements; and we can do this the more easily, as the plan adopted for bringing the statistical information before the public is the same this year as last: we have the same number of tables, and their contents arranged in the same manner.

In Table No. 1 we have the acreage in each crop in each county given, as well as the total acreage under a rotation of crops in Scotland. There is a considerable increase in the total acreage, arising, we are told, from returns being made in 1857, and not in 1856, by "357 occupants in Caithness, and 545 in Orkney, rented at between L.10 and L.20, and possessing 19,987 acres in tillage." If these had not been included in 1857, there would in reality have been a decrease of 8606 acres. We drew attention last year to the anomaly which existed in some of the counties, such as Argyll, Kirkcudbright, and Roxburgh—viz. that while, from the high prices of grain, there was every inducement on the part of farmers to turn up grass-lands, and which was generally done in the other counties, the three mentioned above were an exception. We find that in the returns of 1857 there is a decrease in the total acreage of Argyll and Roxburgh, which nearly corresponds with the decrease in the land under grass—thus fortifying us in the opinion expressed last year, that farmers, in returning their schedules, had evidently misunderstood the heading of the column "Grass and Hay under Rotation."

We are fully borne out by the results of last year's statistical inquiry in the remark we have made more than once, that price regulates very much the distribution of the crops. The collection of the Agricultural Statistics having commenced about the time that the great rise took place in the price of wheat, the growth of

that serial has been extended more and more every year, till it reached the highest point in 1856. Owing to the great difference in the value of an acre of wheat and an acre of barley in 1855, arising from the scarcity of wheat abroad and fiscal regulations at home, an immense increase took place in the growth of wheat, and a decrease in the growth of barley in 1856. The consequence was a scarcity of barley, and an unavoidable rise in the price of it; which, added to the very disastrous harvest in 1856, injuring the most of the wheat grown in Scotland, turned the tide in favour of barley; and we had last year about 40,000 acres fewer in wheat, and about 33,000 acres more in barley; while oats, which have during these years steadily maintained a high price, show an increase in 1857 of about 20,000 acres. The potato disease of 1856 made farmers more cautious, in 1857, in growing them. Hence we have a decrease of about 10,000 acres in potatoes, and a consequent increase of 16,000 acres in turnips.

There is little worthy of notice in Table No. 2—Proportional Acreage of the Crops in each County. Barley and oats have increased in proportional acreage to nearly what they were in 1854, but wheat is still considerably above what it was then. Turnips have been gradually increased since 1854, but potatoes reached the greatest proportional acreage in 1856, and in 1857 they have relapsed to a proportion less than in 1854. It says much for the healthy state of agriculture in Scotland, that there has been such a gradual increase in the proportional acreage of green crops, attributable mainly to the increased cultivation of turnips. With the exception of Caithness and Orkney, there was a large proportional acreage in turnips, and smaller in potatoes, in all the counties of Scotland.

In our remarks last year on Table No. 3—Estimates of Gross Produce per County—we stated, that "we believed that from the sad experience of last year (crop 1856), neither wheat nor potatoes will be so extensively cultivated this year" (1857). We have seen that this has been verified by the Statistics of 1857, where the decrease in the acreage of these two crops has been very great. We find also that the decrease in the gross produce of wheat has been upwards of 1,000,000 bushels, but that there has been an increase in the gross produce of potatoes, showing that the produce of potatoes available for food at the time the Statistics were collected in 185[illegible] greater than in 1856. Another reason for [illegible], that more potatoes were lifted and sold [illegible]on, before there was any appearance of taint in the cro[illegible] having found it their interest now to lift the crop early, rather th[illegible] allowing it to remain in the ground, to run the risk of disea[illegible] was a considerable increase in the gross produce of barley, oats and turnips, but not so much in the latte[illegible] from the increase in the acreage. The fact

is, that while in some districts the turnip crop has been the largest known to have been grown there, in others it was a failure. Fife, as formerly, has the largest gross produce of wheat and barley, Aberdeen of oats and turnips, and Perth of potatoes.

The results of Table No. 4—Estimate of Average Acreable Produce per County—are more dependent on the state of the weather than those of any other of the tables. We are told in Mr Maxwell's report that "the most favourable reports emanate from Argyll, Ayr, Bute, Dumbarton, Lanark, Renfrew, and Stirling, all western counties; the most unsatisfactory from Aberdeen, Banff, Caithness, Elgin, Forfar, Kincardine, Ross, and Sutherland, on the east coast: while the mixed—one crop greater, another less than last year—from counties principally intermediate. While the western districts enjoyed propitious weather both for ripening and securing the crops, great damage along the range of the east coast was incurred in some places from early aridity, but generally from rain during harvest." The largest acreable produce in 1857 of wheat was in Lanark, of barley in Arran (being about 8 bushels more than the next highest, viz. Haddington), of oats in Haddington, of turnips in Zetland, of potatoes in Renfrew. The results of the turnip crop, as detailed in the Statistical Report, are quite in accordance with what we knew from private information. In those districts where the deficiency of the turnip crop is greatest—as in Aberdeen, Nairn, Kincardine, Forfar, Sutherland—complaints were numerous, at an early period of the season, as to the shortness of the crop. And had those gentlemen from the districts where the turnip crop was undoubtedly larger than usual, made particular inquiries as to the state of matters in other districts besides their own, they would not have given such outrageous prices for stock in October, as they would clearly have found out that the turnip crop was not so large in the country generally as was thought. The number of half-fat cattle now hurried into market, for which there is no sale, shows that, notwithstanding the open winter, many have miscalculated as to the produce of their turnip crop, which they have overstocked, and they are now forced to sell their cattle to preserve them from starvation. The deficiency in this crop in 1857, as compared with 1856, in Aberdeen alone, is about 116,000 tons.

Passing over the next two tables—viz. the Estimate of Average Acreable Produce per District, and the Weights of Grain per Bushel in each District—we come to the Appendix, which is the return of all the stock made last July. As was to be expected, owing to the decrease in the acreage under grass, there has been a decrease in the total number of stock, but by no means to the extent that might have been looked for. There has been an increase in horses and cattle, but a marked decrease in sheep, principally in the number of lambs. There is no district more than another in which

this decrease is marked, but almost all the counties show a slight decrease. On turning back to the returns of 1854, we find the increase in the total stock in 1857 to be 938,000 over that of 1854.

We have now finished our observations on the Agricultural Statistics, and we shall proceed to direct attention to some remarks which they have called forth. It has been truly said that figures can be made to prove anything, and an Irish paper (the *Waterford Mail*) has attempted to prove from the Scotch and Irish agricultural statistics, the superiority of Irish farming to Scotch, and the greater agricultural wealth of Ireland as compared with that of Scotland. Now, no one ever disputed that the agricultural resources and wealth of Ireland, if only judiciously developed, were very great, and far surpassed those of Scotland; and the writer in the *Waterford Mail* ought to know that, whatever Scotch farmers are in their own country, they were not slow to perceive the superior advantages of Ireland over their own country for the investment of their capital and the exercise of their skill and enterprise; and that the changes which have been produced in Ireland, in the appearance of the country and in the improvement of its agriculture, have been due in no small measure to the immigration of Scotch capitalists and farmers. Surely the writer must have heard what the Scotchman, Mr Pollok, has done, and is doing, on his lately purchased extensive estates in Ireland, where he has introduced the Scotch system of agriculture, in carrying out which he is spending at the rate of £1000 per week in wages?

We proceed at once to give and analyse the figures as presented in the *Waterford Mail*, from which he has drawn such a favourable conclusion regarding Irish farming:—

	Ireland. Acres.	Scotland. Acres.
Wheat,	562,581	223,152
Oats,	1,978,878	938,613
Barley,	246,257	277,274
Total cereal crops,	2,787,716	1,439,039
Potatoes,	1,146,920	139,819
Turnips,	349,964	476,691
Other green crops,	107,994	11,093
Flax,	98,074	1,534
Meadow and Clover,	1,369,421	1,459,805
Bare Fallow,	...	18,582
Total under crops,	5,860,089	3,546,572

Now, every one knows that, though the gross area of Ireland is not much greater than that of Scotland, yet the extent in mountains, rocks, and unimprovable moors, is much larger in the latter than in the former, and the land available for agricultural purposes

ıust be considerably less: hence we are not at all surprised at he results brought out by the Statistics, that the land in hay and ınder rotation in Scotland is not two-thirds of what it is in Ireand. And it must also be borne in mind, that what is returned s meadow and clover, is in Ireland generally all cut and used or hay, either on the farm, or sold for exportation to England. Ve may suppose that one-half is used on the farm, in which case t cannot be reckoned an exhausting crop; and that the other half s sold off the farm, thus at once entitling it to be classed among he exhausting crops. In Scotland, on the other hand, meadow ınd hay—or, as it is entitled in the Scotch Statistical Returns, "Grass ınd Hay under Rotation"—includes not only what is cut for hay, but and that is in pasture for one or more years; it may be for ten or nore years, and is turned up every now and then in a lease. Now, ıot much of the acreage under this head is used for hay; we think ve are safe in saying that not more than one-half of newly-sown-lown grass (or seeds, as it is called in England) is made into hay to e sold off the farm, which will be about 323,042 acres. Then as regards the potato; if it is grown to be consumed by stock on the farm, we are inclined to reckon it among the green crops; but if it s grown for exportation, we must consider it among the exhausting crops. We cannot but view the state of both the population and agriculture of Ireland with some disquietude, if the great increase in the cultivation of the potato has arisen from the population relapsing into their habits of living and practice of cultivation previous to 1847. "It is the prelude of evil when a kind of food, such as the potato, which requires little exertion to obtain it, becomes the staple support of a people." The most melancholy feature in the agriculture of Ireland, presented by the statistics of 1857, is the increase in the cultivation of the potato—an increase of upwards of 42,000 acres over the quantity grown in 1856, and of upwards of 800,000 acres over that grown in 1847, when the population was greater. And yet we have the writer in the *Waterford Mail* glorying in the increase, and praising the farmers of Ireland for cultivating a root which, in its sound state, is so much more nutritive than the turnip. But was all the produce of this crop in 1857 sound? And has the writer forgot the effects of the over-cultivation of the potato in 1847, and the too great dependence of the people on it as an article of food—a root which two or three days of rain and thunder generally render quite useless? Has he forgot the heart-rending scenes of starvation, and its dire consequences, which occurred then? And can he now recommend to his countrymen a system which was productive of such dreadful consequences.

But the greater part of the potato crop may be exported, as we know much of it is, to England. We shall suppose that one-half

is grown for exportation, in which case it becomes an exhausting crop. The figures then will stand thus:—

	IRELAND. Acres.	SCOTLAND. Acres.
Exhausting crops, including all the cereals, half of acreage in potatoes, flax, and half in meadow and clover, in Ireland; and 323,042 in hay in Scotland,	4,143,950	1,833,524
Restorative crops, including half of acreage in potatoes, turnips, other green crops, the remainder of meadows and clover not included above, and bare-fallows,	1,716,128	1,713,038
	5,860078	3,546,562

We have supposed one-half of the potatoes grown in Scotland to be exported from the country. They are never allowed to be sold off the farm on well-managed estates, unless a certain quantity of manure is bought and laid on the farm. Thus, we see, from the above figures, that the quantity of land in exhausting and restorative crops is as 414 to 171 in Ireland, and as 183 to 171 in Scotland. We leave the intelligent farmers of Ireland and Scotland to judge which is the best system. The truth is, by the former system—that of Ireland—the most fertile soil would soon become exhausted, unless there was an enormous outlay in the purchase of manures; and we have yet to learn that the amount spent in the purchase of manures is greater in Ireland in proportion to the acres cultivated than it is in Scotland.

The writer in the *Waterford Mail* then proceeds to remark on the stock-returns, in the following terms: "It strikes us, with reference to the live stock, that the Scotch farm with fewer horses than we do in Ireland, and this leaves them a larger supply of food for their other stock; and when we see they have larger quantities of turnips and clover, we are rather surprised at the great disproportion in cattle, as they have only one-fourth of what we have in Ireland." Now, if the writer had taken pains to consider well the subject on which he wrote, he would not have felt such surprise at the great disproportion in cattle; his surprise would rather have been how the Irish farmers obtained winter food for their cattle. If he does not know, we can tell him now that the live-stock returns of Scotland are made in June or July, when no cattle are on turnips, and that our markets during the summer and autumn months, till the month of December, are overflowing with cattle from Ireland, which are purchased by the Scotch farmers to consume their turnips. But what do the statistical returns tell us of the turnip and mangel crop in Ireland? Why, that in 1857 there [illegible] upwards of 60,000 acres fewer in these crops than in 1853— [illegible] immense decrease in the cultivation of the very crops which are [illegible] an improved system of husbandry. It is no wonder [illegible] half starved specimens of Irish cattle are

exhibited in our markets, the liability of which to disease is notorious when we know the wretched treatment to which they must be subjected at home from the want of proper winter food. We have marked with much interest the great improvement which has taken place in the breed of cattle which are sent over from Ireland, and we are of those who think that Ireland will ere long be the country of the improved short-horns, if attention be paid to its agriculture in connection with its breed of cattle; and we cannot therefore but condemn the suicidal policy which the Irish are pursuing, in raising and distributing in their country the finest breed of cattle in the world, and at the same time in diminishing the cultivation of the very food necessary for the existence of that breed—in raising up with the one hand, and pulling down with the other. Our Irish farmers must bear in mind that even their improved cross-breeds must have better food than what their original coarse breeds were accustomed to.

We have made the above remarks, not with the view of maintaining "the boast applied to Scotch farming," or of wishing to continue the "opprobrium which has been heaped on Ireland and the Irish," but in the most sanguine hopes that Irish farmers will make a vigorous effort to put a stop to the retrograde movement which their statistics have shown us has been going on in their agriculture for some years. We have seen with pleasure the magnificent cattle which have been bred in Ireland; we have observed with interest the specimens of their green-crop products at the Smithfield Show, and read the useful accounts of their methods of cultivation, which would do credit to any country; and we have marked with wonder the rapid strides which Ireland was making in agriculture a few years back. But we could not shut our eyes to what was exported of cattle, potatoes, grain, hay, &c.—a system which could not be continued long, even on the best soil and with the most favourable climate, without the best system of agriculture. Let not any one suppose, that because much of the agricultural produce of any country can be exported, its agriculture must be good. Russia exports its wheat, Spain its cattle, America its flour; but these exports are made under the worst systems of agriculture, and with the manifest deterioration of the soil. In conclusion, we would advise our Irish farmers not to be flattered and misled as to their true position by any such articles as that in the *Waterford Mail*, but rather to follow the sound advices repeatedly given in the *Irish Farmers' Gazette*, which has already lifted its warning voice against the system of agriculture now pursued in Ireland, as indicated in the Agricultural Statistics of 1857, which we have now been considering.

We cannot close these remarks on the Agricultural Statistics of Scotland without expressing our regret at the prospect of their being discontinued. Most of our readers are acquainted with the

present general position of the question, but we do not think that all fully understand the point in which the misunderstanding between the Treasury and the Secretary of the Highland Society now merges. At the first, the duties undertaken by the Highland Society through their Secretary, and by the enumerators and members of committee, were entirely voluntary. The experiment, tried the first year with three counties, and again in 1854 with the whole of Scótland, being successful, Mr Hall Maxwell "more immediately assumed the personal charge and responsibility of the conduct of the inquiry" in 1855. When asked to name a sum as salary or remuneration for his services, he declined doing so, and stated, moreover, that he would not accept of any sum which would be considered as salary. What was given, therefore, to Mr Maxwell, and is now called salary by the Treasury, was given "*as a slight recognition*" of his services, or "as personal remuneration to yourself as Secretary to the Highland Society, in consideration of the labour which will devolve on you in that capacity in the prosecution of the inquiry." These are the words of Sir J. E. Tennent to Mr Maxwell. The labours of the enumerators and members of committee were almost gratuitous. We must therefore never lose sight of the position in which Mr Maxwell was placed and regarded by the Treasury and Board of Trade. He was regarded as Secretary of the Highland Society, and thanked as such in the letter acknowledging receipt of the Statistical Returns last year; and as he never received what could be called a salary or payment for his services, he could not be regarded a civil servant of the Government. Nor could he yield to the demands of the Treasury, and become a member of the Civil Service, without resigning the Secretaryship to the Highland Society, as the Directors had declared that the two offices were incompatible.

Mr Maxwell's position being evidently an exceptional or anomalous one, could the Treasury not yield, if the Agricultural Statistics of Scotland, collected in the manner and at the cost at which they were done, were really of the value they were said to be? The last letter from the Treasury gave a decided answer to this question; it was in these words: "The due administration [illegible] the public service demands that regular accounts should be required of an officer receiving salary from the public, and discharging the functions undertaken by Mr Maxwell, involving the expenditure of a grant of Parliament to the amount of £4000 [illegible] year." Strictly speaking, Mr Maxwell was not a salaried officer, as we have [illegible] but if the Treasury considers any [illegible] receiving a [illegible] *honorarium* for services rendered as [illegible] member of the Civil Service, then there [illegible] Maxwell but to conform to the rules of [illegible] office. Now, there is one statement [illegible] calculated to mislead as to the

true bearings of the question—viz. "*regular accounts should be required*," &c. We would be apt to suppose from this that regular accounts were refused by Mr Maxwell; but what are the facts of the case? "When the accounts for 1856 were rendered, fully vouched, but without the details of the enumerators' expenditure, while no special authority for the employment of enumerators or clerks, nor any specification of their rates of remuneration, were assigned, and for petty personal and office expenses, amounting in all to about £20, my affidavit was tendered as voucher, £3168, 2s. 3d., being the fees to enumerators, clerks, &c., and personal or office outlay, were disallowed." Now, in the ordinary way of doing business, we would certainly feel surprised at this, when we knew that every enumerator's, every clerk's, stamped receipt was sent up to the Board of Trade. Why, then, did they disallow the sums represented by the vouchers of these gentlemen? Because Mr Maxwell refused to render a detailed statement of the enumerators' expenditure, and to recognise any authority as requisite for the employment of these gentlemen other than the mutual arrangement between them. On this, then, the whole difference between the Treasury and the Secretary to the Highland Society latterly hinged. It will be observed, then, that it is a question now entirely of authority. Mr Maxwell was required to send to the Audit Office on what authority he appointed the enumerators, according to what scale he gave them their gratuities, and—what *he would never have got from the enumerators*—a detailed statement of their expenditure.

We could imagine the Treasury officials supposing Mr Maxwell a salaried servant, and requiring of him a strict adherence to all their rules; but the greatest stretch of imagination could never make us suppose how they could regard the enumerators members of the Civil Service, or public accountants, and require of them the details of the expenditure of their paltry pittance of a gratuity. To illustrate the position of all parties in this transaction, we will suppose that the clerk of a road trust gives in an estimate showing the trustees that he can manage the roads next year for the sum stated in the estimate. The trustees grant the sum, and the clerk forthwith proceeds to employ the necessary hands for carrying his plans into execution. At the end of the year he presents his accounts all fully vouched, the wages of the men even being vouched. What would be thought if the trustees demanded in addition from the clerk a detailed statement of the application of the wages of those whom he employed? The conduct of the Lords of Her Majesty's Treasury does appear to us most paltry and insulting to the whole staff employed in the collection of the Statistics —first to express satisfaction in their work, and confidence in them; and afterwards, though the work is equally well done and satisfactory to the Lords, to withdraw that confidence. However little the

labours of all those engaged in the collection of these Statistics may be appreciated by the Lords of the Treasury, we are confident that the public are fully alive to the importance of these labours, and are ready to award to them that praise which they so richly deserve. And while we give all praise to Mr Hall Maxwell for the tact, the ability, and energy he has displayed, and to the Enumerators and Members of Committee for the painstaking diligence they have shown in the Collection of the Agricultural Statistics, we think that no small merit is due to the farmers of Scotland in general for the public spirit they have shown in voluntarily making public details of their business which could have been obtained in no other way.

LAVERGNE ON AGRICULTURE AND POPULATION.

We have had frequent occasion to introduce M. de Lavergne to the notice of our readers. He is one of the few Continental writers on agriculture, in the present day, whose works possess much interest to the British farmer. They have been extensively read in his own country, and he has done more than any other individual to make his countrymen acquainted with the agricultural practices of Britain. It is curious that we should be indebted to him, a foreigner, for the first comprehensive survey of the state of British agriculture in recent times, a task which he has accomplished in a very interesting manner, and, upon the whole, with a wonderful degree of accuracy. His Essay on the rural economy of Britain has passed through several editions in the original, and is well known in this country from the translation of it which has been published. He has long since announced an entire course of rural economy, but the publication of this has been deferred from a variety of causes. Meanwhile he has been using his endeavours to promote the cause of agriculture, and to diffuse sounder and more intelligent views of its interests among his countrymen, by publishing at intervals a series of Essays, contain-ng the valuable results of his long experience and observation. These appeared successively in the *Revue des Deux Mondes*, from July 1855 to April 1857, forming a connected series from the ime of the great Parisian Exhibition in the first mentioned of these [illegible] lown to the official census of the population in 1856. These [illegible] ave now been collected and republished in a small volume, ich we have perused with much pleasure, as an interesting con-bution to agricultural literature.

Much of them [illegible] escriptive of the Great Paris Agricultural [illegible] [illegible] already given an account of in a previous

Number of the Journal. We propose to notice in a similar way some of the other subjects discussed in the volume now before us. They relate to a variety of topics, bearing more or less closely on the interests of agriculture, and contain many suggestions from which we ourselves may profit. M. de Lavergne has shown himself to be not only well acquainted with the more common and practical details of husbandry, but competent to treat of it in its highest departments—in its relations to the State, to the Legislature, and to the people and nation at large. His knowledge of facts is extensive and accurate, and the more speculative parts of his writings are characterised by moderation and good sense. His views are, in general, brought forward with much clearness, and there is a vivacity in his mode of thinking, as well as a force and piquancy in his manner of expressing himself, which seldom fail to give an interest to his treatment even of subjects somewhat abstruse. The principal subjects in the present volume, besides those which may be said to have arisen out of the Parisian Exhibition, are Free Trade (*la liberté commerciale*), the effects of the Peace, and the national Census of 1856, all of which he treats of mainly in their relations to agriculture. His opinions on these subjects are well worthy of consideration, and we shall, accordingly, endeavour to give a short account of them.

In no country of Europe have restrictions on commerce been carried a greater length than in France. This policy has been at all times adopted; but in former times it can scarcely be said to have been so rigorously adhered to as it has been in recent years. Whenever the question comes, in any form, before the Chamber of Deputies, they are sure to confirm the principle of the restrictive system; and what has been done elsewhere in favour of freedom of trade, seems to be regarded as a warning rather than an example to be followed. To such a length has this feeling been carried, that on the occasion of discussing the question as to the free admission of live stock, the celebrated Marshal Bugeaud—himself an eminent agriculturist—exclaimed, that he dreaded an invasion of cattle more than an invasion of Cossacks! Yet though the prevailing sentiment is so decidedly in favour of Protection, the principles of Free Trade have been long known and had zealous advocates in France. Fénélon recommended the removal of all restrictions on commerce as the dictate of good sense. M. de Gournay contended for the principle of admitting the greatest competition among buyers, by opening to the seller every possible market. Turgot, and the Economists generally, adopted the same view as a part of their system of political economy. Colbert habitually forgot or disregarded the famous maxim of the Marquess D'Argenson, *Pas trop gouverner;* and the memorable remonstrance made to him by the merchants of the day, *Laissez nous faire*, may be said to embody the principle of Free Trade. At the

time when the Anti-Corn-Law League was in operation in England, a similar association was formed in France; but the public opinion being against it, it led to no result. Another attempt was made under the Republic; but this also was frustrated by the National Assembly. It was ill-timed, for prices had fallen so low in consequence of the political crisis, that the possibility of any kind of importation alarmed producers more than ever. Every subsequent movement in the same direction has met with a similar fate. Yet, as M. de Lavergne remarks, the continually increasing success of Free Trade in England has at length attracted the attention of the most refractory minds; and what above all things has given an impulse to the idea of commercial freedom, is the high price maintained by every kind of merchandise, particularly of substances used for food.

He therefore unhesitatingly repudiates the idea of protection of any kind for French agriculture. "In my opinion, national agriculture has absolutely no interest in preserving the system called protective: its interests are rather of a contrary nature. It could only become connected with such a system in consequence of a misunderstanding; and, to tell the truth, it is the language of the Free-Traders themselves which has been the principal cause of the error. Commercial freedom is good everywhere, in France as well as in England; but the reasons for adopting it are not exactly the same in the two countries. The members of the French Association for Free Trade have not taken this difference sufficiently into account: they have, in the spirit of imitation, employed in France the same arguments which Cobden and his friends did in England; and as the true state of things demanded others, their advocacy has led to false conclusions; instead of producing conviction, they have caused irritation."

In France, at the present time, the import and export of corn, as is well known, is regulated by what M. Lavergne characterises as a very ingenious system, borrowed from the English, and known as the sliding-scale. This, however, has been frequently set aside, and at the present time it has been suspended for three years, foreign corn being admitted by a simple duty, according to weight, of 25 centimes the hectolitre. A similar reduction of duty has been made, for nearly the same period, on live stock and wool. From these, and other similar instances, M. Lavergne concludes that, at the present time, none of the agricultural products of France are protected against foreign competition; that, in fact, the protective system can scarcely be said any longer to exist in reference to agriculture.

Still, however, this arrangement is merely provisional, and dependent on the will of the Government. The abstract question of free trade does not appear to be making much progress in the public mind, and our authors labour to remove existing prejudices,

and place the subject in what he believes to be the true light. For this purpose he takes a view of the three great products of husbandry—live-stock, grain, and wool—and shows what effect the measure in question would be likely to exercise on each. Let us notice some of his statements under each of these heads, for they are possessed of nearly the same interest in reference to our own commercial policy as they are to that of our Continental neighbours.

It was the apprehension of the Protectionists, and the hope of Free-traders, that when all restrictions to importation were removed, live stock would flow into the country, so to speak, in a continuous stream; and not only so, but that meat and salted provisions would come from the uttermost ends of the earth—pork, fed for nothing, from the United States, and beef from the pampas of South America, where oxen might be obtained in any quantity for the trouble of throwing a lasso. How far was this prospect realised in France, in reference to fresh and salted meat, when the duty on the former was reduced, in 1853, from 18 francs to 50 centimes the 100 kilo., and on the latter from 30 to 10 francs? The importation, no doubt, increased. From 6000 quintals in 1852, it rose to 41,000 in 1855; but even the last-mentioned amount affords only four ounces of meat annually to each individual. The superabundance, therefore, so noisily predicted, was very far from being experienced.

"When we consider the matter closely, we will perceive that, even in Russia and America, production has its limits. The oxen of the steppes are no doubt numerous, but before reaching us they must pass through crowded populations, who do not live on air; they are subject, moreover, to formidable epizootic diseases, which carry them off by thousands. The Americans kill many pigs, but they likewise eat many, and they do not fatten them without expense. I have the table of their exports before me. I there perceive that, in the most terrible years of European scarcity, as in 1847, they were unable to export salted pork beyond the value of 9 millions of dollars, or 45 millions of francs, which was distributed over the whole globe, and that since 1847 this export is on the decrease. With regard to the immense herds on the banks of the La Plata, thirst, insects, diseases, the inroads of the Indians, civil wars, the ignorance and wastefulness of the Gauchos, reduce the numbers beyond belief; and the coarse preparation the flesh undergoes, dried in the sun and half-putrid, renders it good for nothing but feeding the negro slaves of the American colonies: the poorest of our consumers would place no value on it.

"All this will change, it may be said. I hope so; but for this time is necessary. In the mean time, wants will increase likewise; the population will augment both in the countries of the producers and the consumers; the expense of transport will rise, and the

national producers, who are all on the same footing, will always have a marked advantage over those who are separated from us by thousands of leagues.

"I have not yet mentioned the strongest of all reasons to give us assurance on this point. This capital, decisive, and unanswerable reason, is the vicinity of the English market. England has opened her ports, for all time coming, to the live stock the whole world can sell to her. She habitually pays more for meat than we do, although she produces more, because she also consumes more. What, then, have we to fear? As with every other kind of merchandise, meat will go to the place where it brings the best price. We can only expect such foreign meat as, from the place of its origin, obtains more profit by coming to us than to England, on account of a difference in the expense of transport. Of this the quantity is necessarily very limited, since the two countries border on each other. It is the English market which, as the most advantageous, must give the tone to others. All tends thither, and will continue to do so. In Holstein, Mecklenburg, and even in Holland, the production of live stock has in view only the English market. Nay, we ourselves have in many respects a real interest, even at the present time, and still more if prices decline among us, in carrying our produce to the same mart.

"We are accustomed, in treating of these questions, to confound all in general terms, and to consider, for example, importation and exportation as two facts completely exclusive of each other: this is an error. It may readily happen that there is an advantage to import at one district of a country, and export at another. We have an export which never ceases, even in times of excessive high prices, such as the present. In 1856 we imported 49,000 cattle and 300,000 sheep; at the same time we exported 12,000 of the former, and 50,000 of the latter; and if our own prices had not been so high, we would have imported less and exported more. This we must never lose sight of. The English market acts not only on foreign markets, but on our own: a Norman or Breton ox may be sent to Jersey or London at less expense than to Paris or Rouen, while, at the same time, a purchaser in Alsace or Provence has greater advantages in buying from his neighbours of the Rhine or Alps than from national dealers much more remote. The expense of transport, in the final account, yields no profit either to the producers or consumers."

Our author's conclusion, from a detailed examination of the subject, is, that the national interests would not only not suffer, but be greatly benefited, by free trade in live stock. He still more strongly deprecates restrictions on the admission of corn, as even [illegible] useless, if possible, than those on live stock, for the cereals [illegible] less value than meat, of equal weight, and they cannot be [illegible]ed carry far without doubling the price. Besides, they cost

more to produce them, inasmuch as they cannot be obtained, like grass and pasturage, without culture; and they represent, even in the most fertile countries, an amount of labour and capital, which the production of live stock does not in the first instance require.

Under the sliding-scale adopted in 1821, the prices of corn have varied exceedingly in France. The average price in 1821 was 18 fr. the hectolitre: it fell to 15 in 1822, rose the following years, again to decline; and finally, in 1847 was 35 fr., in 1849, 15 fr., and in 1855 32 fr.—enormous differences, which demonstrate the complete inadequacy of the system intended to prevent such fluctuations. Nay, according to our author, the action of the sliding-scale is even favourable to these fluctuations, for although they may originate in other causes, it never fails to aggravate them.

"As with regard to meat," he says, "there exists for corn an average price which reconciles all that it is desirable to maintain; I regard this as about 20 fr. the hectolitre. I willingly admit, moreover, that if the north-west of France can produce with advantage below that price, the soil and climate of the south-east require a little more. There has hitherto been a considerable difference between the markets of Nantes and Marseilles, which sometimes amounts to 50 per cent. I admit that this difference, although gradually diminishing from the effect of railways, which every day afford more and more easy communication with the intermediate markets, has something fundamental in it. I admit then, besides the average price, the principle of zones—that is to say, all which goes to constitute the sliding-scale. Finally, I am aware that the region where importation may be carried on on the largest scale, is precisely that where the prices are highest—namely, the shores of the Mediterranean. I am not the less convinced that, if the sliding-scale were set aside, not temporarily, as at present, but permanently—if foreign corn were admitted into France free of duty, or, still more, at a fixed duty, and if, along with this, exportation became free at all times—the results sought for by the sliding-scale would be much more certainly obtained, and the fluctuations of prices brought to their inevitable limits by the single effect of the natural movement of commerce.

"The greatest defect of this pretentious mechanism, as with many others, is that it attempts to bring about artificially what would take place of its own accord. By the very nature of things, importation diminishes and exportation increases when the price of corn in the interior of the country becomes low; the contrary happens when the price rises. It is useless to take measures to bring about this result—it is sufficient not to thwart it. Prices are like fluids, they tend to their own level. Can it be supposed that, in 1849, when corn was so low-priced, more grain would have been introduced if importation had been free, and that, in the following years, when prices were so high, more would have been

sent away, even though exportation had not been interdicted? The sliding-scale shut the ports, in both these cases, to an importation and an exportation equally ideal. It has the sole effect of injuring commerce, which is deprived of solid grounds for establishing its calculations. Nothing can be more uncertain than the play of this arbitrary mechanism: the zones may be inaccurately defined, the regulating markets injudiciously chosen, the sales false and incomplete. In all cases the results are not known for a month after they are taken, and in the interval of time necessary to prepare the sales and purchases, the whole may be overturned."

In the case of wool, M. de Lavergne arrives at the same conclusions as he does with live stock and corn, although the question assumes a somewhat new aspect in regard to that commodity. If corn and live stock, introduced from abroad, furnish only an insignificant item compared with the whole mass of the national produce, the case is different with wool. It admits of being transported more easily than corn or meat, and at less proportional expense; it therefore comes from the most distant countries. In fact, the quantity imported into France is nearly equal to the quantity produced there: in 1855, thirty-five millions of kilos. of foreign wool, mostly washed, were imported. The national produce cannot much exceed that quantity. Instead of being opposed to commercial freedom, this enormous introduction affords a new argument in its favour. It has, in fact, been coincident, not with low, but with high prices of the native wool, and in spite of custom-house regulations, supposed to be prohibitive; so true it is that all combinations intended to overrule facts and necessities end in results altogether illusory.

The disastrous effects that measures too severely protective have exercised on French agriculture, are strikingly illustrated by several instances of a miscellaneous nature mentioned by M. de Lavergne. Those who lately sent articles for exhibition to France experienced nothing of this nature, for at that time the regulations were temporarily relaxed in their favour. The laws relating to the admission of agricultural machines, for example, virtually amount to a prohibition. At one time the duty was so high as to double the value of the machine; and even under a recent decree, reducing the duties, the formalities to be gone through are so complicated and annoying, that the principal Belgian manufacturers have determined not to sell any of their agricultural machines in France. Can anything be imagined more likely to retard the progress of the country in this important department of the art? The case is nearly similar with regard to guano. "Is it not strange, and a matter of regret," says M. de Lavergne, "that this substance is dearer in France than anywhere [illegible] England, Belgium, and North America, employ considerable [illegible]ies of it; it p[illegible]ates into Saxony, in the centre of [illegible] among [illegible] scarcely purchased at all. Why is

this? No doubt because the greater part of our cultivators have not the means of purchasing it at any price, but also because it is rendered artificially dear by our custom-house system. On this occasion there is no indigenous guano to protect, but the national navigation must needs be protected; and whatever arrives under a foreign flag is subjected to an overcharge—another chimera, of which the folly might well be perceived, for the most strictly protected of all our interests, navigation, is precisely the one which makes least progress. Guano is the cause of immediate fertility in meat, bread—in all that is most urgently demanded. With guano we gain ten years: we can transform, almost visibly, an ungrateful into a fertile land, and speedily obtain a great cereal production, preparing, at the same time, for the future by forage-crops, which, without this resource, could only be done at the expense of much time and preparation. But what of this? Guano infects the vessels which convey it, and our seamen think twice before having anything to do with it. The English and American navy is less scrupulous, because they have a greater number of vessels. Why then refuse to have guano except from French vessels, when it is so clearly proved that we can obtain only very little of it, and at a very high price?"

Of all the products of France, wine perhaps is the commodity of which the free export would contribute most to the national advantage. For some years the vine has suffered in that country, as everywhere else, from disease; but it is regarded there as a transitory evil, and does not create much apprehension for the future. In ordinary times it certainly constitutes one of the greatest of their agricultural interests; and M. de Lavergne affirms that they could, so to speak, supply the whole world without interfering with their own consumption. In the southern parts of the kingdom there are uncultivated, or very imperfectly cultivated, tracts of land, of great extent, admirably adapted to vine-culture; and perhaps it is no exaggeration to say that the produce might be doubled, if sufficient outlets could be found to induce the trial. English consumers, according to our author, are unacquainted with the good ordinary wines of France, particularly those of the south. If they knew them better, they would be more anxious to obtain them. Mr Bosville James has endeavoured to show that if the duty on wines were reduced to one shilling per gallon, a salutary change would take place on the habits of the English people, without injuring the public revenue. If it could be sold, by retail, at a shilling a bottle, it is thought that it would come into general use; and while it would not supersede the favourite beverages, ale and porter, it might diminish the consumption of spirituous liquors, alike injurious to health and public morality. M. de Lavergne's remonstrance against the English duty on French wines we must give in his own words:—

"At a time when the intimate alliance between France and England, so long assailed by secular obstacles, but so conformable to the rightly-understood interests of both nations, has been confirmed by a common action on the field of battle, it would be more appropriate than ever to cement it by concessions in the customs. The English have already made great advances; it is for them to take the last and most important step, in order that they may be left open to no suspicion. While they maintain the interdict pronounced against our common wines by the old policy of war, in order to protect those of Spain and Portugal and their own national beverages, it may be said, erroneously no doubt, but with the appearance of reason, that they proclaim the principle of free trade when they think themselves in a condition to benefit by it, and are the first to refuse it to applications from which they apprehend risk. But even supposing that it may be a sacrifice for them to do away with this impost, they owe it to the honour of the principle and the future of the alliance."

It is difficult to read this without a smile. That we have conceded so much seems to be regarded as an argument that we should concede all, and that to a nation which pursues an entirely opposite line of policy, and makes no return to our liberal measures in such a way as to give them the full effect we desire; for it is only by a system of reciprocity that free trade can be fully established. M. de Lavergne forgets what he said so truly a few pages back, when speaking of the export of grain: "How can we ask foreign nations, such as Naples, Egypt, and Russia, to remove the barrier to exportation, when we maintain it ourselves? There is an evident contradiction." It is not our intention to enter into the merits of the question in this place; but it seems reasonable to suppose, that if a light, pleasant, and slightly stimulating beverage, such as the wines in question, were placed within the easy reach of our people, it might have the happy tendency to supplant those stronger and grosser potations in which it is still the national propensity too freely to indulge.

The efforts made by France in the late war have weighed more heavily on the national resources than has been generally supposed: the object of one of M. de Lavergne's essays is to show what effect it has had on the interests of agriculture. During its continuance he assures us that agriculture languished more than any other branch of industry. Deprived by the war at once of hands and capital, it had also to contend against unfavourable seasons. The price of articles of food, raised to excess, afforded the means of estimating the amount of the deficiency. The public imagination became excited, and every one came to understand that the supply of food to the nation was a matter of importance beyond every other. The return of peace was therefore anxiously longed for; and it was hoped that, above all things, it would immediately turned to the advantage of agriculture. "The agri-

cultural interest," says M. de Lavergne, "is nothing less than the national interest in its highest sense. Agriculture is the most immense of all industries; it occupies of itself more hands, and yields more products, than all the rest put together. Its very magnitude creates an obstacle to the rapidity of its progress; for the least of its movements requires an enormous expenditure of powers; and even when these powers are in operation, as the slow revolution of the seasons is necessary to advance a single step, nothing can be done without time." On all occasions of urgency, particularly of the kind just referred to, it is the invariable custom of the French people to look to the Government for aid. They have no reliance on their own resources; they are too impatient to wait for the reaction which commonly restores the disturbed equilibrium, and the State is called upon to do what the people had much better do for themselves. Against this tendency of the French mind our author warns and remonstrates, and defines, we think, with much judgment, the limits to which the interference of the Government should be confined in its dealings with agriculture. It is not, he thinks, by directly conferring benefits on it that the State should act on agriculture, but rather, by affording it all facilities and security, should allow it to develop itself of its own accord. The Government is not absolutely interdicted from interfering with husbandry, but its action has narrow limits. What it ought above all things to study is, not to do it injury, for in this instance it is more powerful for evil than for good. This doctrine, we imagine, is somewhat new to the French people; and it is of consequence that they should learn to understand its importance, not only in reference to agriculture, but all the other industrial arts.

The effects which the different methods of raising soldiers in England and France exercises on agriculture are referred to by M. de Lavergne; and he takes advantage of the opportunity to congratulate his countrymen at our expense, in a manner for which we can readily make allowance. To our minds the single fact on which he rests the supposed superiority of the French soldier (namely, that suitable men are selected from the people, and *compelled* to enter the ranks), is an exercise of despotic power which nothing can warrant, and for which nothing can compensate; and the absence of this abuse in our own case far more than makes amends for all the advantages to which he lays claim. "The French army, besides being four times more numerous than the English, is composed of the *elite* of the population, subject to a forced engagement, and selected man by man; while the other is recruited only by voluntary engagement, and consequently receives nothing but the refuse of other employments.* Our military power gains

* Numbers of a very superior class to the "refuse of other employments" enter the army of this country; and, we suspect, few of our readers who have seen French soldiers will admit their superiority in any respect over our own.

by the system we have adopted; agriculture and the industrial arts lose by it: in England, on the contrary, the military power loses; agriculture and manufactures profit. Five hundred thousand men, in the vigour of their age and health, must necessarily leave a considerable void in the fields and workshops. Our Continental position, and still more our national taste for the show and din of arms, oblige us to keep on foot a large military establishment; but it is much to be desired that we should not go beyond what is necessary, and that we should restore to rural labour as great a number as possible of those vigorous arms which are as well fitted to manage the plough as the musket. Alas! they cannot all be restored: many there are who must be lost to us for ever, prematurely swept away by the murderous storm!" But not only has French agriculture been deprived of the multitude of hands making up this great army; an immense number have likewise been taken from rural occupations in order to assist in furnishing it with the necessary supplies. M. de Lavergne calculates that if 250,000 men were to be despatched to a distance of 800 leagues, it would require nearly an equal number to be engaged in transporting them, and supplying them with provisions and other requisites. Another drain on the rural population has been the extraordinary improvements going on in Paris. La Marche and Limousin, the departments which supply the greatest number of masons, are actually without able-bodied inhabitants, and cultivation is literally at a stand.* Our author is therefore of opinion that these improvements, desirable in themselves, should have been spread over a great number of years, which would have kept down the price both of labour and materials, and interfered less with the cultivation of the country. He concludes this part of the subject with the following striking remark: "Paris is decidedly, without any possible comparison, the most magnificent city in the world; it is time to think a little of France, which, if care is not taken, may well become one of the poorest countries of Europe." Other proofs of the decrease of the provincial population in many parts of the country will appear when we come to notice our author's remarks on the census of 1856.

Among the means to which our author looks forward for the improvement of husbandry, railways occupy a prominent place. [illegible] not the cause of its direct progress, they are the infallible cause [illegible] ulterior progress. He states, that on examining the state [illegible] it is perceived that the valleys are in general [illegible] cultivated, and the plateaus much less so. Not only [illegible] the soil less fertile, but the communications in such places are more

* [illegible] masons that left the single department of La Creuse in 1856 [illegible] been estimated [illegible],000. The total population is 287,000, so that the loss is more than [illegible] grown-up and able-bodied inhabitant.

difficult, the produce less easily removed, and foreign merchandise less easily introduced. Another fundamental difference is observed between the north and the south, the former being twice as rich, and twice more thickly peopled, than the latter. Railways will bring together and equalise the north and the south, the plateaus and the valleys; they will facilitate exchange of produce, always so favourable to reciprocal wealth, and open up to the poorest districts the means of access to great outlets and wealthy capitals. They will be of the greatest benefit, moreover, to a large tract of land, of a silicious nature, which runs through the very centre of France, forming nearly a fifth part of the country, which can be fertilised only by a large intermixture of lime. With the ordinary means of transport this becomes too expensive at many points, but with railways the whole will be brought into profitable cultivation. Railways, therefore, are regarded as the only counterpoise to the formidable causes of impoverishment which have afflicted the country since 1848. M. de Lavergne affirms that there are ten times a greater number of railways in England than in France, in proportion to its surface; some, indeed, are of opinion that there are too many in England, but in France the present number may be quadrupled with advantage.

The project of a law has been submitted to the French Legislature, for the purpose of obtaining a loan of a large sum of money to be laid out in draining, after the method that has been followed in England. Our author, who has done more, perhaps, than any other individual to make the importance of drainage understood by his countrymen, does not altogether approve of this measure. He is of opinion that the principle of direct loans by the Government to individuals for a specific purpose, is not good in itself, and opens the door to many abuses. If the State took the sum proposed to be lent from its ordinary revenues, the evil would not be so great; but if the sum be borrowed, who knows but that it might have been more profitable in the hands of the lenders than in those of the borrowers? Drainage is not the only agricultural improvement which may yield great profits—it is not even the principal in France, as it is in England; for in the former there is neither the same soil nor the same climate, and it has not reached the same degree of agricultural wealth—a condition, according to M. de Lavergne, which is necessary to render draining remunerative.

We believe that the notion is very generally entertained that capital invested in agriculture yields smaller and more precarious returns than if employed in trade. Whatever may have been the case of late years, when farming has been so unusually profitable, occasions are not far to seek when probably the majority of farmers would be inclined to agree with Burke when he says, "I have been a farmer for twenty-seven years, and it is a trade the most precarious in its advantages, the most liable to losses, and

the least profitable of any that is carried on. It requires ten times more of labour, of vigilance, of attention, of skill, and, let me add, of good fortune also, to carry on the business with success, than what belongs to any other trade." But this is applicable in some degree only to farming on the old and obsolete system; its operations are now much more regular and assured; its resources are multiplied manifold, and its returns can be looked for with a degree of confidence which could not in former times have been thought warrantable. Nothing, indeed, can now entirely disappoint the hopes of the husbandman, in the varied departments of his business, except a season of such unusual severity as very rarely occurs. M. de Lavergne considers the idea that agriculture is less profitable than what is usually understood by manufactures, to have arisen from mistaken views of the subject. In the first place, the profits of manufactures are exaggerated: we look only to instances of striking success, and forget the much more numerous cases of signal failure. Again, capital invested in agriculture is dispersed over a great extent of territory, and its results are less conspicuous; while, in the other case, it is concentrated in visible masses, and a small number of establishments, which strike the eye and the imagination. Other considerations, to which we cannot now advert, concur in producing an impression which he thinks must needs be erroneous, from the consideration that, were it otherwise, there would be no inducement to engage in husbandry, and it would be abandoned for more profitable pursuits.

In every country of any extent there is necessarily much land lying waste; in France the extent of uncultivated surface is very great—not less than nine millions of hectares, or the equivalent of fifteen departments: about the third part of this is fit only for bearing wood, but the two other thirds, or six millions of hectares, admit of cultivation. To render available these nine millions of hectares, would be in reality to increase the extent of the national soil by a sixth. Almost the whole of this territory is situated in the southern half of France: Bretagne is the only northern province where a vast extent of it is met with. Here is an almost boundless field for the enterprise of capitalists,—one which, if properly engaged in, would add immensely to the productive resources of the nation.

In touching upon the subject of agricultural instruction, M. de Lavergne says that it is to be acquired in two ways, by experience and science; here he thinks the influence of the State may be exerted with advantage. Foremost among the means of disseminating knowledge he is disposed to rank agricultural shows and meetings; this leads him again to refer to the great French expositions, and in so doing, some of his remarks are so judicious and discriminating, that we must give them, without any other change than is required by translation: it would no doubt have been better if, as in

England, agriculture itself had taken the initiative; it would have been more true, real, and useful: unfortunately, it failed to do this, and the defect could not have been better supplied. According to our custom, we have surpassed, at the very first trial, the finest of the English exhibitions both in elegance and riches. *If the reality be wanting to us, we are never wanting in appearance.*

"Instead of a meeting in the open field, held successively in different parts of England by means of subscription-money alone, and where every one is exposed to the rain and sun, we have had an immense garden, under the roof of a matchless palace, in the middle of the most superb capital and the most beautiful promenade in the world, surrounded with trees, grass-plots, flowers, statues, fountains; innumerable erections for the animals, arranged with perfect taste and exquisite neatness; choice specimens of all the races of Europe, conveyed and supported at the expense of the State; keepers of all nations, Tyrolese, Swiss, Hungarian, Scotch, in their picturesque costumes; a crowd of elegant and beautiful women, circulating in spring dresses through this scene of wonders, and filled with surprise that agriculture, in itself so dirty an art, could put on an appearance so graceful and charming.

"The population of Paris will always more or less resemble the Roman people in this, that it will be at all times necessary to furnish them with bread and shows; and it is not for me to complain that this great theatre sometimes receives agricultural decoration. The Exhibition of 1856 has taught us nothing new, but it has had the important result of bringing home to the most incredulous an order of facts unknown to the public. Every one now knows that agriculture, like other branches of industry, has its inventions and its wonders, and that a Durham or Angus ox, a Swiss, Scotch, or Dutch cow, a Southdown or Cheviot sheep, an Essex or Leicester pig, are creations as deserving of admiration as a locomotive or mechanical machine. The ill-judged jokes formerly so well received when directed against the same class of animals assembled at the Versailles Institute, will not now find currency. When we hear that bulls may be sold for 30,000 francs, the fact still surprises us, but it no longer appears absurd and impossible, and we are naturally led to conclude that agriculture, when rightly managed, may be a lucrative speculation."

While recommending the French farmers to meet frequently, and discuss subjects of common interest, he points to England as an example, expressing, however, his opinion that their meetings there may almost be said to be too frequent: clubs, meetings, exhibitions, consume too much of the farmer's time and money; in France they go to the opposite extreme, and scarcely meet at all. Some of the more public associations have been lately suppressed, and others exist only in name; they possess, however,

some good journals devoted to agriculture, among which is specially mentioned M. Barral's *Journal d'Agriculture Pratique.*

The census of 1856 has brought out some curious results regarding the population of France in recent times. The most important of these are the facts that the population is increasing more slowly than in most of the other countries of Europe; that the deaths, in certain years, greatly exceed the births; and that there is a great internal movement going on in the shifting of the people from one province to another. In the last quinquennial period, terminating in 1856, the increase of the population was only 256,000 souls. The progress of the population for rather more than the last half-century has been as follows: in 1790 it was 26,500,000; twenty-five years later, in 1815, it was 29,500,000—a difference of 3,000,000; thirty-one years later, in 1846, it was about 35,400,000—a difference of 6,000,000; ten years after that, in 1856, it amounted to 36,000,000—a difference of 600,000. From this it follows that during the Revolutionary and Imperial period the population increased on an average at the rate of 120,000 yearly; during the period of the Restoration and the constitutional monarchy, at the rate of 200,000; and in the ten years elapsed since 1846, at the rate of only 60,000. In almost all the countries immediately adjoining France—England, the Low Countries, Germany, Italy—the progress of the people has been much more rapid, and a much greater number subsist on a given extent of surface. In 1851, for example, Belgium contained 147 inhabitants on every hundred hectares, England 130, Holland 90, Germany 80, Italy 80, France only 67. This difference is no doubt in some measure owing to the great losses of men sustained by France during the wars of the Revolution and the Empire, and which have not yet been entirely made up by thirty years of peace; but as the other nations mentioned likewise suffered losses of the same kind, though less severe, to this apparent cause there must necessarily be added some other, which continues to operate even during peace. The *moral restraint,* or voluntary continence, spoken of by Malthus, has certainly had some influence on this result; for though his doctrines have been much combated in France, they have nowhere been more instinctively followed. M. de Lavergne is inclined to ascribe to this cause the small number of births, which remained almost stationary, or appeared even to diminish, since 1789.

We have said that there is a great internal transference among the French people from one district of the country to another. This appears very strikingly from a tabular view of the population, indicating the increase and diminution in the different departments. In fifty-four departments the population has fallen off since 1851; in thirty-two only has there been an increase, and among these thirty-two there are only twelve in which the augmentation has been considerable. The Haute Saône has of itself lost nearly a tenth part of

its effective inhabitants. The department of the Seine, on the other hand, has gained most—not less than an increase of 305,000 souls. Such a gigantic augmentation is altogether unexampled. There is in France, as in so many other countries, an increasing tendency for the people to gather into towns. Not only have the principal French towns received a great increase, but even the smaller ones experience a similar influx of the rural population. These accumulations of the people in large towns are, in France, attended with peculiar dangers: if they arise from natural causes, they must be submitted to, but care ought to be taken not to excite them by any artificial means. These masses, says M. de Lavergne, are now asleep, but they may awake at any moment, and we know well how terrible their awakenings are. Yet, in ordinary cases, he admits that this tendency to abandon agriculture for the sake of trade and manufactures is only conformable to the law of progress. At the present time, however, the movement is not gradually progressive, but so violent as to produce a complete disturbance in the labour market. Agriculture has lost all at once an immense number of hands, without trade or manufactures, properly so called, having gained them, and production suffers in all its forms.

These notices, we hope, will suffice to convey some notion of the views entertained by this distinguished writer on some of the topics in which agriculture is concerned, and also of the intelligent manner in which he discusses such questions; our space will not permit us to give further extension to the subject. The circulation of such works in France is likely to be attended with much benefit, for the real interests of husbandry appear to be still very imperfectly understood by the great body of the people. If it has made great progress in recent times, it must be remembered that it might very easily, under proper direction, have made much greater, and that the progress made is not so much absolutely as comparatively great, having set out from a very low starting-point. The tranquil and somewhat monotonous pursuits of provincial husbandry are, we fear, not well adapted to the fickle and pleasure-seeking character of the people, and they are naturally disposed to prefer the bustle of large communities and the excitement of city life. The necessity of obtaining agricultural produce, however, is a consideration of paramount importance, and the inducement to engage in the cultivation of the soil will probably become stronger and stronger. In many respects they are certainly prosecuting the subject in the right way and in the right spirit; and we have no doubt that their exertions, if duly persevered in, will meet with an adequate reward.

Peace having been restored, and the prospects of agriculture so greatly improved, M. de Lavergne indulges in a reverie as to the future influence of agriculture, and the state of society which it may tend to produce. With this ideal picture—a kind of agricultural

dream, which, if realised anywhere, will certainly not soon be realised in France—we must take leave of our author for the present.

"When I happen to shut my eyes to muse on an ideal world, I see no artificial lake surrounded with factitious cottages, no avenues covered with countless carriages, purchased yesterday, and probably to be sold to-morrow, the whole forming an idle and glittering crowd in the midst of a delightful but deceitful landscape. I see the reality instead of a mere appearance—a real country watered by a real river, strewed with rustic dwellings and peopled with laborious families. The art of man, correcting the irregularities of nature, has there secured the union of the useful and the beautiful. The river, confined within its banks, rolls along its transparent waters in peace, and fertilises the plains it traverses by lateral streams, instead of laying them waste by its inundations. The meadows, soft and green as moss, extend further than the eye can reach, and, fertilised by the most careful culture, support innumerable animals; sheep covered with wool, horses swift of foot, cows with udders distended with milk. The roads, as well kept as the avenues of a park, wind through fields covered with corn, and vines loaded with fruit; the carts, bearing the produce of the harvest and vintage, cross each other easily in every direction. The houses, as elegant but more commodious than the most ornamented cottages, are surrounded with flowers and shade; but those who inhabit them ornament them with their own hands, and there peacefully enjoy an easy existence purchased by their everyday labour. At a little distance appears the town, which, as well paved and lighted as a capital, should not have more than a few thousand inhabitants, all engaged in the practice of the arts, sciences, and manufactures, and secure, by their small numbers and economy, from the dangers of great accumulations of people. Behind the trees rise here and there a few chateaux, the respected abode of useful influences, of accumulated capital, and leisure honourably gained and honourably occupied. Everywhere wealth obtained by labour and honesty, nowhere corruption, luxury, or play; and in order to complete the measure of happiness man is capable of enjoying on this earth, the church overlooking this scene, at once active and peaceable, recalls to the minds of all the thought of God, and consoles them by the prospect of eternity [illegible] which are inseparable from our nature.

NOTES ON NOVELTIES AT THE SMITHFIELD CLUB SHOW.

By Robert Scott Burn.

In noticing the novelties of the Smithfield Show of last year, we had, in nearly all the departments of agricultural mechanism—from the implements of the field to the machines of the steading—something new to describe. This year our task will be confined to the description of isolated novelties, many of the departments being altogether destitute of examples showing improvements in old constructions, or attempts at new combinations. Nor is this paucity of the exemplifications of new thoughts to be wondered at. The exhibition of implements is not recognised officially by the club under whose auspices the Baker Street Show is held. Again, the interval between the date at which it is celebrated, and that of the great gathering of the Royal Agricultural Society, which precedes it, is so short, that little time is afforded for the elaboration of new ideas, and their presentation in the form of practically working mechanism. The lack of official recognition, therefore —the "cribbed, cabined, and confined" treatment which, for want of space, the exhibitors meet with—together with the higher attraction and more abiding fame presented by, and resulting from, the exhibition of more new things at the Royal Society's meetings—all tend to make our agricultural-implement makers look upon the Baker Street Show as a medium rather for the sale of their old and established, than for the exhibition and discussion of new mechanism. There is, nevertheless, at the gatherings which take place from year to year, enough of novelty to attract attention, and of innovation to provoke discussion; and a practised "hand" can, from among the old things exhibited—the names and uses of which may be as familiar to him as household words—pick out something of interest.

While, however, noticing, let it not be supposed that we are lamenting, this lack of novelty; the hasty and abundant production of new things is not necessarily an evidence of true progress; not seldom, indeed, is it an evidence to the contrary. This hastening after "new things" has a tendency to keep men from fully considering first principles, and from the painful and steady application necessary to perfect mechanism, by which these principles can best and most fully be carried out; and in view of this consideration, it is doubtful whether, as stimulating this search after novelty, our "prize system" has not been productive of more evil than good. Other branches of mechanism have made wider and more rapid strides to perfection than that of agriculture, and yet have neither had the publicity of shows nor the stimulants of prizes. Let it, however, be understood that we refer to that "novelty"

which aims more at the changes in combination of details than in the discovery of new principles of action, or of correct mechanical structure and arrangement. This "novelty" which we condemn, or wish, at least, to see less highly thought of, is a mere ringing of the changes in old things—"old friends with new faces." Far are we from wishing to keep men in the old—the beaten track, merely because it is old and well-trodden by our forefathers; we wish men to think, to examine all things, to try all things. This thinking, moreover, does not, as some deem it does, necessarily involve a change of action; sound thinking may—nay, often does—lead to conservatism rather than to a desire to change. It is shallow sophistry to say, as is often said, that a man is not a thinking one because he is not a changing one—an adopter of new things. The soundest thinker may be the slowest man; although truly the converse of this does not always hold. Little fear, however, we grieve to say, of many amongst us thinking too much and too highly. The philosopher of old, while intently gazing on the stars, and striving to read their glistening story, fell into the ditch. Small chance truly is there of many of us falling into any ditch from looking too keenly *upwards*. But to the immediate purposes of our paper.

Under the head of ploughs and cognate implements we have nothing new particularly worthy of notice. Not so with the now all-important question of steam cultivation. A model was exhibited of Halkett's Guide-way Steam Cultivating System; and as this has lately been attracting considerable attention, we think that a somewhat full notice of it may be interesting to our readers.

In the words of the patentee's specification, the improvements in the application of motive power to the cultivation of land "consist in applying the implements of cultivation required for the various operations of ploughing, tilling, sowing, reaping, or other operations of culture, by means of a travelling carriage moving on tramways or rails, or on other manufactured ways placed in parallel lines across the fields to be operated upon, whereby the said implements are in heir operation always kept at a regulated height, independent of e small undulations or unevenness of the ground, or the firmness softness of the soil; and whereby they are also kept from varyg to the right or to the left of the line of onward motion. For purpose I lay down permanent ways, dividing the fields or of land in a number of parallel lines, the whole being placed quidistant from each other. The gauge or width between the ines I make as wide as practicable, to suit travelling carriages or latforms to run back and forward. To these travelling platorms I apply or attach the implement or implements to operate oil, their operation being regulated, if necessary, by my [illegible] dants [illegible] travel upon the platform. The plat-

rm may be caused to move over the ground by means of a staonary engine or other power placed at the headlands, but I prefer ae engine to be placed on the travelling platform, to produce its wn locomotion either by winding up ropes at each end of the line, r by means of a rack fixed to the rail, to afford hold to the drivag-wheel, or means provided to give sufficient belt to frictional ontact for the act of propulsion. Paved or other manufactured rays may be substituted for the rails.

" Instead of making the rails or other bearing-surfaces fixtures, he subway may be the only permanent part, and may consist of ines of sleepers, in which the rails are laid down and fitted, so that hey can be lifted and repeatedly laid in the same position. Intead of continuous sleepers, stones or posts may be placed at inter'als, to support or mark and adjust the position of the rails. These tones or posts being permanent, the rails can be adjusted repeatdly in the same position. By thus lowering the rails or their ubway, permanent successive operations can be performed among rowing crops—as, for instance, among growing crops which have een sown by the drill. Other instruments can be readily set to ollow in the broken track at any subsequent period. I also lay lown lines of permanent way along the headlands, for the purpose f transferring the travelling platform from one line of rails to the ther."

In carrying the system into practice, as here sketched out in he specification, Mr Halkett has adopted the following arrangenents: In a field at Wandsworth, where the system is in practical peration, a series of trenches have been dug parallel to and distant rom each other 30 feet. In these trenches, ballast, after the nanner of railway construction, has been laid, forming the foundaion on which the rails are supported. The breadth of the foundaion is 2½ feet; this, with a distance of 30 feet between each foundaion, gives a loss of land for cultivable purposes of 2s. per acre, or ne-twentieth of the land. This loss is, however, very easily reduced y increasing the distance between the lines of rails; for with the imroved system of wrought-iron construction, we see no practical lifficulty in making the travelling platform 50, 60, or 70 feet in readth. On the line of ballast, hollow bricks are laid to act as leepers. The upper surface of these bricks is not flat, but anguar, presenting a section like the letter A with the apex upwards. Rails of wrought-iron, having a corresponding section, are laid in a ontinuous line on the angular brick sleepers. The upper surface f the rails being angular, the tires of the wheels of the travelling latform have angular grooves in their peripheries, into which fits he angular rail.

The main or travelling platform which travels over the lines of ails thus laid down, is composed of timber-framing, the section of which exactly resembles a king-post roof. The beams correspond-

ing to the tie-beam are hollow, being composed of two boards or planks on edge, secured together by cross pieces, the lateral strain to which the beams are subjected being resisted by a horizontal board between the lower edges. Parallel to the rails, transverse bearers connect the tie-beams together, and the upper surface, covered by planking, forms the floor of the platform. The whole is supported by vertical uprights, which afford bearings for the travelling-wheels, sixteen in number, eight on each side. The bearings of the wheels slide up and down within a limited distance in guides formed in the vertical supports; at the upper end of which strong springs are placed, which press upon the bearings or axle-boxes of the wheels. The whole weight of the platform is thus transferred to the wheels through the springs. At each end of the platform, immediately above the wheels, and parallel to the rails, a steam-engine is placed, and the two are coupled together by appropriate gearing, so that their speed is uniform, assuring a uniform progression of both ends of the platform, it being obviously of importance that one end shall not progress faster than another. By a very ingenious arrangement of cranks and connecting-rods, each wheel is made a driving-wheel, receiving its motion directly through the steam-engine. This arrangement gives such a bite of the wheels on the rails, that inclines 1 in 15 are ascended with comparative ease.

To the platform, thus constructed and propelled, the ploughs or cultivating instruments are attached. The method by which the plough-bodies are taken in and out of work may be described here. To the end of a long lever a plough-body is fixed; the opposite end of the lever is jointed to a stud fixed at one side of the platform; this stud is adjustable at various points of the platform. To the end of the lever at which the plough-body is fixed, a curved lever or rod is attached; this is led upwards, and passed through an opening in the platform. To the inner side and upper end of this rod a rack is provided, the teeth of which engage with those of a pinion fixed in a shaft which runs along the whole length of the platform. By turning lever or cross handles fixed at the extremities of this shaft, and placed within the reach of the attendant on the platform, the pinion can be made to act on the rack, and raise or lower the plough-body. A series of plough-bodies and levers thus adjustable is placed at each side of the platform, the ploughs on each side pointing different ways, so that the curved racks of one set are at the opposite side of the platform to the racks of the other set.

The operation of ploughing may now be described. Suppose the platform to be at one end of the rails, the plough-bodies at one side of the platform pointing in the direction in which the platform is to be propelled, are lowered so as to be in contact with the soil; the engines being started, the platform progresses up [illegible] rate of [illegible] miles per hour until it reaches the

opposite headland—the land between the rails being ploughed with a series of furrows in number and at distances corresponding to the number and distance at which the plough-bodies are set. The platform is then moved on to the transverse line of rails at the headland, running at right angles to what may be termed the field-lines. On this headland line a low traversing frame runs; the platform is run on to this frame, which is then moved along the rail till the platform reaches the point opposite to the next set of field-lines, to which it is immediately transferred. The ploughs which were before in action being lifted up out of, and the opposite set lowered into, contact with the soil, the engines are started, and the platform progresses down the lines to the headland from which it originally started. The spaces between two contiguous lines are thus ploughed. It is obvious that all the implements in use in a modern farm can in a similar manner be attached to the platform, and be worked with the same degree of precision.

By the arrangement as here indicated, Mr Halkett states that "the quantity that could be ploughed per day, with power suitable to a farm of 1000 acres, would be 25 acres, and two men would be all that are required to conduct the operation. This calculation, it must be understood, is based upon the work which I have repeatedly done; and, moreover, when the time presses, by a change of men, double this amount, namely 50 acres, may be done in the twenty-four hours, because the operation can be carried on by night as well as by day. Conceive the great advantage of being able thus to break the land up in favourable weather, or for a rapid autumn cultivation. This great economy of time, I may add, is also available for reaping and carrying harvest. The rails, forming a guide to the implements, insure that every operation shall follow in the same line, or parallel to it. Thus I have drilled by the steam machinery rows of plants, and when they have come up, I have hoed them repeatedly by the same steam-engine with the greatest perfection, and at all stages of their growth. In fact, I have placed the blades of the hoes on each side of the rows, so near to them as to act within half an inch distance from the stalks, without doing an injury to a single plant as the machine hoed them. I may mention that I have frequently placed upright in the ground two small sticks (two pencils), at a distance from each other of *one inch*, and having fixed a small stirrer or tine, propelled it at full speed of the engine, cutting the ground between the sticks without on any one occasion disturbing either of them." Indeed, this precision of operation is one of the most noticeable features of the invention; and we may here state, that a complete adjustment of the platform to the lines of rails is farther insured by giving to one set of the driving-wheels a lateral play on their axles: this enables them to adjust themselves to any deviation

from the true parallelism of the rails which may arise from a variety of circumstances—for it is to be recollected that there is no lateral tie between the two lines as in the case of ordinary railways, effected by the *cross* sleepers; the two lines are perfectly independent of each other. The absence of any method by which the width of gauge is maintained between the lines has been urged as an objection to the plan. In practice, however, from the slow rate of speed, no inconvenience in this way is met with.

As regards the cost of the apparatus, Mr Halkett gives the following estimate—L.20 per acre for the rails, and L.3 for the machinery. The former item is thus detailed:—

800 feet of tram brick, ...	L.3	6	4
Laying down and providing ballast, and levelling for tram bricks, ...	3	10	0
Angle iron, $1\frac{1}{2}$ lb. to the foot, and L.14 per ton,	7	17	0
Bolts, ...	0	12	0
Fitting fish-joints, ...	0	10	0
Fishing joints, ...	0	10	0
Punching holes in iron, ...	0	7	0
	L.16	12	4
Contingencies, at 10 per cent, ...	1	13	0
Cost per acre, ...	L.18	5	4

The whole cost of the system may be set down as follows:— 1. Annual rent for the rails, which may safely be put down as not exceeding L.2 per acre per annum for a farm of 700 or 1000 acres, or L.4 for market-land near London. 2. The interest, and wear and tear of the engines and implements, which may be set off against the same for horses and horse-implements. 3. The cost of working the same—the cost of the operation for a farm of 1000 acres being given as follows: Ploughing 5 inches by 10 inches, 1s. 7d. per acre; deep excavation to the depth of 25 inches, 12s. per acre; scarifying, grubbing, &c., 8d. per acre; harrowing, clod-crushing, rolling, 5d. per acre; hoeing (150 acres can be done per day), 3d. per acre; drilling or dibbling seed, 5d. per acre; reaping (cutting and delivery) 60 acres per day, 8d. per acre. All th[illegible] processes have been practically carried out by Mr Halkett, [illegible] the estimates attached to them are deduced from his expe[illegible] [illegible] addition to these processes, Mr Halkett [illegible] [illegible]ground watering," by which he con[illegible] [illegible]er impregnated or not by fer[illegible] [illegible] ground is being stirred or hoed, hollow bars [illegible] drawn [illegible] earth between the rows of plants, the wa[illegible] escaping through apertures in the bars. By this arrange[illegible] [illegible] water does not harden the surface of the earth, and it [illegible] [illegible] the comparative absence of evaporation.

Although not an advocate for rotatory cultivation as opposed to the method of inverting the soil through the medium of the plough, Mr Halkett has used a rotatory digger, which has proved very efficient in reducing stiff clays to a state of thorough disintegration, and in separating couch, &c. from it. We have seen the clay in its natural or normal condition thoroughly matted together with interminable convolutions of couch, and the same after being subjected to the rotatory digger. Nothing, certainly, could be deemed more satisfactory in its results. In this we but share the opinion of many practical men who witnessed the effect of the operation with ourselves. In the important operations of carting manure on to the land and produce off it, Mr Halkett claims for his system a high utility. He states that he can do these processes at a cost of ¼d. per ton per mile, his platform giving a capability of moving a weight equal to 70 tons at a time.

In presenting our notes on the subject, we have acted merely as the exponent of Mr Halkett's own views, refraining hitherto from expressing any opinion of our own as to the feasibility, in a practical point of view, of the system. We may, however, be permitted to quote from an article in which we described the system to a much farther extent, and with more estimates, details, &c. than our space here would justify, contributed some time ago to the pages of the *Mark Lane Express*, our notions on its mechanical features: "It is fast becoming an established opinion amongst engineers and mechanicians, that before the full advantage of the application of steam-power to the purposes of cultivation can be obtained, there must be an adaptation of the land to the peculiar features of the new power to be employed. If local or other peculiarities prevent the free and economical action of the power of steam, these peculiarities must be got rid of before full satisfaction can be obtained. And in the long run it will be found a cheaper method to get rid of, for once and all, those peculiarities which prevent the free action of the machine, than to adapt self-adjusting or other arrangements to the mechanism by which it can be enabled to stop itself till the peculiarities which impede its free action can be got out of the way. Thus we can conceive of a plough being dragged by the steady power of steam across a field, which has self-adjusting mechanism given to it, by which it either stops its own progress if coming in contact with a boulder, or else is enabled to slide over it without damage. But the philosophical, and in the long run the cheapest method of procedure, is to get rid of the stone altogether. Root it out, take it away; it is only an obstacle, and an ever-recurring one, if allowed to remain. Our cotton-manufacturers know the value of this method of working; it is one of the secrets of their success. They grudge no outlay in mechanism and processes to perfect the material for the action of the higher and finishing class of machines. Why should not

our agriculturists do the same thing? . . . . The whole question is one of cost only, not of mechanical or cultural difficulty. If eminent machinists say that, with properly adapted land, they can and will construct machines which shall do the utmost amount of work, and that far beyond the realised produce of the present system, then the first thing clearly which the farmer has to do is to begin this work of adaptation—that is, if he thinks it worth the cost. . . . . When many of our engineers—the gifted William Fairbairn at their head—hold opinions such as those we have endeavoured to state, the time is near at hand when agriculturists will see with them the necessity of 'beginning at the beginning.' It should always be remembered that the adaptation of a new power involves new circumstances of action. The finest locomotive that ever a Stephenson or a Hawthorn made could creep but quietly on our best-paved road, but give it the iron rail, and lo! the lightning speed. It is just when viewed in this way that the system of steam-cultivation invented by Mr Halkett presents considerable promise. . . . . It is just because that, in using a new power, Mr Halkett has carried out a new method of preparing his land, and that, too, a method which experience shows clearly enough —the experience of our railways—is well adapted to the new power. In this mutual adaptation of the power and the land lies the complete novelty of the system in an agricultural point of view, and is that, moreover, which presents a species of fitness and unity which goes somewhat towards satisfying the *mechanical* requirements of the case."

In the department of "Drills and Manure-distributors" we have no novelty to notice. In our article in No. LVI. of this Journal, we described the new things in this department which were exhibited last year at the Smithfield Show. These still maintain the field as the most recent novelties; and we may expect nothing new to be commenced till the near approach of the great gathering of the Royal Agricultural Society at Chester this year. We may state, however, that the "water drop-drill" invented by Mr Chambers, and which we described in the article above alluded to (p. 655), grows in public estimation as a valuable aid in the sowing of turnip crops. Mess[illegible] Reeves of Westbury, Wilts, have this year applied it t[illegible] known "liquid-manure drill:" having [illegible]iscarde[illegible] [illegible] them last year at the Show as [illegible] notice of which will be found [illegible] this Journal.

[illegible] [illegible]ated this year to the exhibition of the [illegible] [illegible]ted to carry out the system advocated by "Sigma," [illegible]otice of which we inserted in last number of this Journal. The [illegible]Hand-dibbling Machine," which we described in the October [illegible] [illegible].), seemed to attract the close attention of many [illegible] [illegible]al to this "[illegible]" apparatus we may

notice the hand "drop" or "bunching" seed-depositor patented by Messrs Reeves of Westbury. The seed-chamber is carried on a frame supported on two light wheels, and consists of a cylindrical vessel placed vertically on the front of the frame; the lower end, through which the seed is passed, comes close to the ground, so that the wind is suffered to interfere as little as possible with the deposition of the seed. The bottom of the seed-chamber is formed of an iron disc, provided with a number of holes or apertures. Above this, and in close contact with it, a corresponding disc is made to revolve; this is provided with a similar set of apertures. As the upper disc revolves, the holes in the two discs coincide at intervals of time corresponding to the rapidity of revolution of the upper disc, and to the distance between the holes. When they are coincident, a passage is afforded to the seed which rests on the upper disc; when the holes are not coincident—that is, when the apertures of the upper disc are opposite the solid parts of the lower one—no passage is afforded to the seed in the chamber.

In the space allotted to machinery on the ground-floor below the galleries, there was, as usual, an excellent display of combined thrashing-machines and steam-engines. Amongst the thrashing-machines we noticed that of Messrs Hornsby of Grantham, Lincolnshire. As this machine has created considerable interest amongst Scottish agriculturists, from the fact of its having taken the first prize at the Glasgow Show last year, a notice of its peculiarities may be given here—as far, at all events, as can be done without the aid of drawings. To the drum eight beaters are provided, these being formed of half-round malleable-iron. The distance between the drum and the "concave" or "breast," between which the grain passes, is adjustable by a simple contrivance, so that any desired amount of beating, scutching, or rubbing can be given to the grain as it passes through. The grain from the concave is passed to the straw-shakers. These are four in number, and are composed of long rectangular boxes; the inner ends being hung or suspended freely on links or swing-bars, while to the centres are attached cranks. As these revolve, a vibratory or up-and-down motion is given to the boxes, and as they are free to move on their suspending links, they have a lateral or to-and-fro motion in the direction of their length. This compound motion is such, that while the straw has a "jumping" or up-and-down motion given to it—that is, being continually jerked, or, to use a homely phrase, kicked upwards from the face of the shakers—it has also a forward motion imparted, which causes it gradually to move from the inner to the outer end of the shakers. The shakers are not placed horizontally, or on a level from end to end, but a considerable angle, the lower ends, which are those suspended by the links, being placed nearest the drum or beater. As before stated, the shakers are composed of long rectangular boxes; their

length being about 11 feet 3 inches, their breadth about 15 inches, and their depth 6 inches. They have no bottom, and the top or upper surface is composed of a series of lats or strips placed obliquely to the surface, so as to form a series of louvre openings, through which the corn, pulse, chaff, &c., can fall: in addition to these openings, the upper surface of each box or shaker is provided with a series of spikes.

As the main bulk of the straw passes from the inner to the outer end of the straw-shakers, the pulse, chaff, grain, &c. fall through the louvre openings to a receptacle beneath. This receptacle is formed of sheet-iron, and is placed at a considerable angle, so that one end is higher than the other. The sides, from a breadth equal, or nearly so, to that of the machine, slope gradually downwards and inwards, until they terminate in a circular channel. In this channel, and placed at the same angle, an Archimedean screw revolves; its length being over 6 feet, and its diameter being about 15 inches. As the receptacle or channel in which this screw revolves is placed at a considerable angle, the pulse, corn, &c. which fall from the shakers descend to the lower part. From this they are lifted gradually and equably by means of the revolving screw to the upper part of the channel, over the edge of which they fall, and are delivered to riddles which are placed immediately but at some distance beneath. Beneath the first riddles a second set is placed; and as the corn, chaff, &c. pass from the upper to the lower set, they are met by a blast of air from a revolving fan. The chaff is thus blown towards the back of the machine in the direction of the outer end of the shakers, beneath which a riddle is placed; on this the chaff is received, and is subjected to a cleansing process, the chaff falling from it into one receptacle, the pulse into another. The cavings or inferior corn pass from the second riddle below the Archimedean screw into a horizontal trough, which runs at right angles to the large Archimedean screw. In this trough a screw revolves, which delivers it to a second Archimedean screw placed at an angle, and working in a channel, the upper end of which overhangs that of the channel of the central screw. By this arrangement the cavings which are passed from the riddles are lifted up and passed to the chan[illegible] the main screw, which redelivers them to the action o[illegible]ddles. The good corn passes from the [illegible] rid[illegible] which has a shaking motion given to it; [illegible] by an elevator, which is situated near the [illegible], and delivered to the first barley-awner, [illegible] the upper part of the machine, and at right [illegible]ngth. From the awner or hummeller the corn is passed [illegible] set of riddles, and in its passage through which it [illegible] the blast from a revolving fan. From these riddles [illegible] second barley awner, which is placed also at the

ɔr part of the machine, but runs at right angles to the first er, or parallel to the side of the machine. The knives of this er or corn-cleaner are arranged on the central axis in a ;al form, so as to form a traveller or delivering-screw, which es the corn to a vibrating screw placed at one end of the hine; from this it passes to a corn-blower, where it receives action of a blast of air. From this the corn passes off, accord- to its quality, to different shoots or spouts—the light corn from spout, the best corn from a second, and the screenings from ird.

ı the department of the "Preparation of Produce for Market" have to notice one or two novelties, the first of these being rotatory corn-screen or separator exhibited by Messrs Reeves, ınted by Mr Palmer of Stockton-on-Tees, and used in a .-known thrashing-machine. In general appearance it assumes form of a cylindrical screen or cage, the periphery of which omposed of wirework, having zones of different finenesses. ,s towards the upper or feeding end—the shaft of the cylinder ıg placed at a considerable angle—the meshes are formed of finest wire, the coarsest being at the lower end, the space veen being taken up by two zones of intermediate finenesses. re are thus four zones, and each zone is provided with a spout ;ed under it, which carries off its peculiar products. Thus the , zone, or finest, discharges to its spout the fine dust and seeds; second, the "thin corn;" the third, the "tailings;" and the ·th, the best corn. A fifth spout is provided, which carries off ɛier substances than the other meshes are capable of passing. the interior of the screen or cylinder a series of segmental titions, or blades of iron, is fixed; they extend from end to of the cylinder, and are placed at distances from each other al to 1¼ inches. The grain, as it passes from the upper to the er end of the cylinder, has a tendency to arrange itself along lower part of the cylinder, and as the partitions revolve along h the cylinder, they dip into the grain thus lying in its lower t, and, rubbing against them, facilitate their escape from the ɜen by placing them in a line with the meshes. In addition to ı result of their action, the revolving knives or blades spread the grain over a larger surface of the screen than is due to the ion of revolving screens of the ordinary description where knives are not used. The screen revolves in contact with a ɜl-wire brush placed the length of the cylinder, at one side of, l near its upper part; this brush is adjustable by screws.

Mr Roby, the manufacturer of the well-known corn-dressing ɜen, exhibited a new method of adjusting the distances between wires of the screen, so as to make one body suit different fine- ses of grain. Below the upper and permanent series of parallel ·es a second or lower set is placed; by a simple screw-adjust-

ment these lower wires can be moved from side to side through a limited distance, so that, from a position immediately beneath the upper set, they can be moved so as to occupy a position centrally behind two of the corresponding wires in the upper series. By this arrangement, suppose the distance between the upper wires to be half an inch, by moving the lower set so as to occupy the central space, there will thus be a wire between the two upper wires, reducing the distance one-half or less, according to the diameter of the wire of the lower series. We may here state, for the information of those who may not be acquainted with the screen to which Mr Roby has applied this contrivance, that it is composed of an open vibrating screen placed at a considerable angle, having at its upper end a hopper, from which the grain is delivered uniformly over the surface of the screen below it; the frame which supports the hopper giving bearings to the crank-movement by which the vibratory motion is given to the screen.

Messrs Barnard and Bishop of Norwich exhibited Holben's Patent Barley Aveller or Hummeller. This is simply a method of giving, through the aid of mechanism, a reciprocating motion to that form of hand-hummeller which is so familiar to our practical readers. The hand-hummeller to which we allude consists of a square frame of cast-iron, provided with a series of partitions crossing each other so as to form a series of square cells without top or bottom; this is usually provided with a cross-handle, which serves to work the implement up and down amongst the barley to be hummelled. In Holben's machine, the square-celled frame is retained, but he joints to it a connecting-rod, which is jointed overhead to a crank-shaft, to which motion is given by a train of wheels from a fly-wheel and shaft worked by hand or machine. The grain to be hummelled passes over a floor or shelf in a thin layer, and is subjected to the reciprocating action of the celled frame.

In the department of machines for the preparation of the food of stock we have nothing new to notice. In an article under the same head as the present, in the March number of this Journal (No. LVI.), we described the three novelties as Bentall's root-pulper, Samuelson's combined turnip and straw-cutter; since then, nothing novel has been brought out—so far, at least, as the implement galleries of the Baker Street Show gave any evidence at the last exhibition. To this remark, however, there may be an exception in the case of the straw-cutting machine of Mr W. Snowden of Longford, Gloucester—although no novelty in one sense, having been patented many years ago, and in use for some considerable period—from the marked contrast it presented in its general mechanism to that of other straw-cutting machines, and in the comparative ease with which a great bulk of material was cut by its means; it certainly presented itself to many of the visitors to the Show as a novelty worthy of some attention. Its principal peculiarity is

the absence of feed-rollers, and the great depth or thickness of material from 3 to 7 inches, subjected to the action of the cutting-knife. If this large surface of material kept moving outwards continually, it would add greatly to the power required to work the machine by pressing on the knife; but by an ingenious contrivance the hay or straw to be cut is passed outwards only at the intervals where the knife is not cutting. The hay or straw to be cut is brought forward on an endless cloth, some 7 feet long, supported on rollers, one at front, and one at the back. Towards the front of the machine, vertical grooves are made in the sides; in this a heavy cast-iron block moves up and down; to a stud in the centre of the upper side of this block the end of a lever is jointed; this is carried forward, and its other extremity attached to a stud in the centre of a cross bar on the upper edge of a frame which has a reciprocating or up-and-down motion given to it, through the medium of a crank fixed on the axle of the fly-wheel which carries the cutting-knife. To this lever, jointed at one end to the iron block moving in the grooves, and at the other to the front frame which moves up and down by the immediate action of the fly-wheel shaft, a lever or bar is fixed transversely—that is, at right angles: this bar is nearer the front frame than it is to the iron block, and has at each extremity a pivot, from which is suspended a pressing-board, which is parallel to the front frame. When this pressing-board is in contact with the hay, it affords a point of resistance to the cross bar, this acting as a fulcrum on which the lever works, which is jointed at one end to the iron block, and at the other to the reciprocating frame. Thus, when the iron block goes down in its grooves, the presser board rises up, and *vice versâ*. The iron block thus acts as feeder and presser alternately, accommodating itself to all thicknesses of hay or straw passing over the feeding or endless cloth, and which depth of material has a maximum of 7 and a minimum of 3 inches. The whole is set in motion by a single crank; and having no complicated array of cog-wheels, worms, and rollers, it seems less liable to get out of order, and more easily worked, than other machines where these complications exist.

Mr Simpson of Petersham, Surrey, exhibited a "Hay and Straw Band-making Machine," which possessed a feature of some novelty. By it three bands can be made at the same time, the three hooks which give the twist to the ropes or bands receiving motion from the same power—the centre hook being attached to the shaft of the fly-wheel working in the centre of the frame, each side-hook being connected with shafts placed right and left of the central shaft, from which they receive motion through the medium of equal diametered pulleys and driving-belts. It is clear, however, that, as all the hooks receive motion from the same power, if the hooks are permanently fixed to their shafts, if one of the workers wishes to attach a rope to a hook—having finished his task before

any of the others—all the hooks must have their motion stopped before this attachment to a single one can be made. To obviate this loss of time, each hook, when not engaged in twisting a band or rope, is allowed to remain in a quiescent state, although its attendant shaft continually revolves; but as soon as a rope is attached to it, and the "drag" put on it by the attendant, it is pulled outwards, and is immediately engaged by a catch on the end of the shaft, so that it partakes of its motion as long as the "drag" is on. On the "drag" ceasing, or when the attendant releases the finished rope from the hook, a spring pushes the hook out of connection with the catch of the shaft; and although the shaft still continues revolving, it does not give motion to the hook.

Amongst a variety of miscellaneous notices connected more or less directly with agriculture, Mr Clayton, the manufacturer of the well-known brick-making machine, exhibited a model of a cottage for agricultural labourers, built with tubular bricks made by his machine. We advert, however, to Mr Clayton at this time, principally as he is connected with a patent which has an immediate interest to all those connected with tile and brick works—we mean the patent of Mr Hand, the object of which is to economise or rather utilise—which is the truest way to economise—by means simple and inexpensive, the heat generated in kilns or furnaces during the burning of the materials. From information furnished us by Mr Hand, while visiting Mr Clayton's stand, and from other sources, we derive the following description of the peculiarities of the system: A horizontal flue is carried along the drying-shed, through which the heated air and smoke from the kilns are passed on their way to the final exit or chimney. The horizontal flue is raised above the floor, and affords a heating surface throughout its length, by which the temperature of the shed is maintained from 120° to 130°. Traps are formed in the upper side of the flue, affording openings communicating with the interior of the flue and the drying-shed. The moistened air in the shed, coming from the evaporating surfaces of the bricks or tiles, is drawn by the current in the flue through the traps, and is carried off to the chimney. The process has been adopted with marked success at the new brick-manufactory at Farnham, the complete arrangements of which have been attracting considerable attention. At this establishment there are two kilns, each capable of containing 35,000 bricks, one inch of space being given between each brick and the kiln-sides. Three furnaces fire each kiln, the smoke and heated air from which are led off to flues, two ranges of which traverse each drying-shed. There are two sheds, each nearly 110 feet long by 30 broad and 8 high; each flue is 7 feet high, measuring 12 inches inside. The two flues in each shed are worked so as to form a single flue making the complete circuit of the shed. The experience obtained at this establishment with the use of this

drying system establishes two important points—first, that by drying the bricks in a humid atmosphere, the interior of the brick is made to dry before the outside, thus obviating the cracking to which bricks dried under the ordinary system are liable; second, that the hotter the temperature to which the air of the drying-shed is raised, the better dried are the bricks: this is due to the great quantity of moisture in the air, which, keeping the outer surfaces of the bricks moist, allows the moisture from the interior to be withdrawn as quickly as possible without cracking or breaking the brick.

R. S. B.

THE FARMERS' NOTE-BOOK.—NO. LIX.

Good and Bad Farming.—The Emperor of the French having offered medals to be awarded to the best farmers in several of the departments, the leading men and judges of the farms entered for competition have availed themselves of the opportunities afforded them in their respective districts at the distribution of the medals, to express their opinions regarding the advantages of good farming to individuals and the nation; and by drawing a contrast between good and bad farming, to show wherein the excellences of the former consist. We need not say that such practical discourses must be attended with the greatest benefits to those to whom they are addressed. M. Paul Thenard—who is known both as a man of considerable wealth and as possessed of great scientific attainments, and is also distinguished as an enthusiastic farmer—in giving away the medals in his district, took occasion to stir up the latent energies of the farmers about him by showing them in what those who had obtained the medals differed from the great majority of their brethren. They were too apt, he said, to attribute the success of any one in farming to his wealth. But he said the same sun shone, the same showers fell, the same winds blew upon the fields of the rich as well as upon those of the poor farmer; and that the difference lay, not so much in the possession of capital as in knowing how to lay out that capital to the greatest advantage, and in adopting a proper system of agriculture. Thinking that some of his remarks may not be without their use and profitable application in some parts of our own country, we have translated a portion of his speech from the *Journal d'Agriculture Pratique*.

"All good cultivators will bear me out in what I say, that we must have plenty of forage, and plenty of good forage, for many animals, and for many good animals. Without this there can be no good agriculture. It is, then, for the production of forage, whether natural or artificial, or good roots, that they apply themselves

before everything else. For that, besides meadows, they sacrifice the half, and even three-fifths, of their arable land; wheat, rape, and the other exportable products of the farmer occupy the least part. But what wheat! what rape! what crops! They are worth twice, and often three times, as much as ours. Here, then, the soil is well employed with less manual labour.

"Wheats and oats are of the first importance with us. We devote two-thirds of our lands to them; one-sixth to fallows and legumes for consumption at the steading; and the forage plants scarcely occupy the remainder. You see the consequence of such practice—less manure and more surface, more labour and less return. Further, with us the live stock is a heavy charge; with them it is a great source of profit. Here, then, is a great difference.

"There is still another cause, entirely commercial, which keeps us lower. Though the wheat fails, the stock is saved; the failure of the wheat raises the price of flesh. There is always something got in, while everything is lost with us. Remark the causes of this success, which is due much more to the efficacy of the methods than to capital; and, therefore, to preserve you from the phantom of progress, do not repeat any longer, 'He is rich, and can do everything; as for us, we are poor, and can do nothing.' Say rather, 'He is rich, and can, and ought, to go faster; but in going slower, we will arrive at the goal also.'

"Since, then, capital is a means of hastening progress, and a powerful means too. See how the celebrated farmers, of whom we have been speaking to-day, dispose of their little patrimony. We shall compare their method of acting with ours. Instead of buying fields at a high rate, they invest their capital in the stocking of the farm; and as the capital increases from the profits, they continue for a long time to invest it there; and when there is nothing which the farm wants—when it is sufficiently stocked with improved animals, with superior implements—and when it is in first-rate order, it is then that they commence to place their profits in investments of good security. And when the years have arrived when their children are established in the world, they retire with them to an enlarged domain, which they purchase with a part of their profits.

"Now, how much do they derive from their money invested in the stocking of the farm? In spite of expenses, often considerable, from burning, liming, irrigating, and draining, which they have frequently to do, even on account of these very expenses they draw from 35 to 41 per cent. What do they do who pass for wise with us? As they derive the smallest profit, they buy a small field here, then another there; and they cultivate it badly; and instead of 35, they scarcely make 4 per cent from their investments. Then the father dies, and his property, already very much divided, is parcelled out still more among his children, who follow the same practice, which is always to be recommenced.

"Thus, while the farmer who, having confidence in his business, has the courage to place his small fortune in it, arrives by degrees to a life of ease, we, who are deficient in that confidence, from being poor, remain poor; and, on account of our bad methods of farming, from being rich, we often become poor. Then there is engendered a disgust with the business—there is a desire to give it up; and this is so true, that there are few cultivators, in these circumstances, who do not long for their children for a place in manufactures, in commerce, at the bar, or some other profession different from their own; so that I who address you, and who have a dread of this sort of things, have every year hundreds of applications for different employments. Now, calculate the number of persons to whom such applications are made, and you will have some idea of the number of wanters; and compute the small number of places to give, and you will arrive at the remainder who are discontented, unfortunate, weak, who are more injurious than useful to society. Such is the deplorable consequence of a bad system of agriculture, and of a bad management of one's means; he is ashamed of and detests the profession of his fathers. And I ask some of you who have been listening to me to-day, and still doubt my words, but are thinking of abandoning your fields for the chances of the towns, to go not far from this, and find the sons of some of those honourable men of whom I have drawn a vivid picture to-day, and ask them what business they are following? and they will all answer with pride, 'The business of our father.'

"The most noble of all the professions is agriculture, when it is nobly exercised. It is it which nourishes the nation, which gives her her soldiers, which gains her victories. The agriculturist trusts to himself; from God alone he asks for success to his labours. He is independent."

Notes on Drainage.—Notwithstanding the admitted advantages of drainage in this country, and the great extent to which it has been carried out, there is still great difference of opinion as to the application of its principles to practice; and it is consequently often yet a subject of discussion at farmers' clubs. The erroneous principle, which took its rise in England, and made some way in Scotland, that a slight increase of depth will compensate for a considerable increase of width in all circumstances, has latterly been much controverted, and the application of it, in Scotland at least, has not been so extensive for the last two or three years as it was some time ago. The most intelligent practical farmers south of the Tweed always supported the proposition of Smith of Deanston, that increased depth did not compensate for increased width. "Drain as deep as you like," that experienced drainer used to say, "but take care and don't go too wide." The rigid rules laid down by Government, to be followed by those who took the Government

money, regarding the depth and width of drains, has caused the almost useless expenditure of much of the funds. We can point to many fields said to have been thoroughly drained according to the Government specifications, which would just require other drains put in between those already made to render the operation thoroughly efficacious. Three-feet drains, placed 18 feet apart, would have been far more effective, and almost as cheap as 4-feet drains, placed 27 or 28 feet apart; for in many districts men cannot be got to dig the 4-feet drains without a very high proportional price for the additional fourth foot.

We find that, in France, the same complaints are made of Government laying down uniform rules to be followed by those who take the drainage-money. The engineers of the public bridges and highways have the charge of laying off the drains, and superintending the work; and, being regulated by a uniform rule, they lay them off at a depth of 5 feet, and about 33 feet apart, irrespective of soil and climate. It is reasonably enough argued, that there are many circumstances in which the drainage could be more effectually done, and at less expense, if parties who applied for the money were allowed to use some discretion in expending it in the different fields on their estates. To this has been attributed the high average cost of drainage in France. We find in the *Journal d'Agriculture Pratique*, that there have been drained, up to 1856,

In France, 86,450 acres, at an average cost of		.	£3	18	10	per acre.
... Belgium, 69,160 acres,	do,	do. . .	3	3	7	"
... England, 1,365,910 acres,	do,	do. . .	2	3	1	"

[We suspect that these figures are rather low.]

In the same Journal we meet with reports of well-conducted experiments on drainage, which are still necessary to convince many of the farmers of the profits arising from it. It is to be observed, that the advantages of drainage will not be so readily appreciated in a country where the climate is comparatively dry, as in ours remarkable for the humidity of its climate. And, besides, the full profits of farming are not realised where the green-crop system is not carried out. It is from the cultivation of green-crops, more than anything else, that the Scotch farmers have derived the benefits from drainage. The improvement from the operation has not been so marked in some of the other crops, such as oats, as to entitle it to that importance which is attached to it in Scotland. M. de Thou cultivated, in 1855 and 1856, two portions of ground, separated from one another only by a ditch. The one was drained, the other was not. They were sown with wheat after a summer-fallow. The crop from the drained part, in 1856, was [illegible]9.8 bushels per acre; and from the undrained, only 6.6 bushels, [illegible] difference of 13 bushels, which at 7s. 2d. per bushel, is [illegible] per acre [illegible] add to this the cost of

the additional straw, we will have a gross total of £5, 3s. per acre. This was the result of a crop grown in a wet year. A similar experiment was made in 1857, a dry year, on other two portions of land, without any apparent advantage from drainage, in so far as the yield of the crop was concerned; but it must be borne in mind, that the expense of fallowing in 1856 was very much lower on the drained than on the undrained land—the difference being reckoned by M. de Thou at 12s. 8d. per acre, or about 20 per cent on the money expended on the drainage. Another experiment is detailed in the same Journal, by M. Biard, who was intrusted by M. Thevenot to perform an experiment for him on M. Thevenot's estate. He divided a piece of ground into two parts, draining the one-half at a distance of 56 feet between the drains, and at an expense of £3, 1s. 9d. per acre. The crop of wheat in 1857, a dry year, bulked into 696 sheaves on the drained ground, while that on the undrained part gave only 600 sheaves, being an increase of 16 per cent from the drainage. The effect of this experiment was, the farmer of the land offered to pay 6½ per cent on the money laid out for the drainage of his farm.

*Steuart on Modern Agriculture in Britain.**—Among a collection of Essays, contributed by members of such a university as Cambridge, we should scarcely have expected the subject just referred to to find a place. The prevailing tone, the subjects of study most in esteem, and the habits of thinking, in that seat of learning, are not favourable to the acquisition of agricultural knowledge, and it is too much the fashion "to depreciate the plodding character of the tiller of the soil, and to turn with aversion from him whose talk is of bullocks." While actually engaged in the studies of the university, scarcely any would probably be found either disposed or qualified to treat of husbandry; but the contributions in question are chiefly from those who have escaped from under the wing of their fostering mother, and are engaged in the pursuits of the outer world. Little or no practical experience, moreover, is required to discuss the subject in the manner Mr Steuart has done. He deals in generalities, avoids practical and statistical details, and touches chiefly on those general principles which seem most suited to the contemplation of the man of science or the political philosopher. In this sense he is duly impressed with the importance of the subject; and his remarks, though in general no way striking either for novelty or depth, will be perused with interest by the "intellectual circle" for whom, doubtless, they are chiefly intended.

It has often been to us a matter of surprise and regret that we

* "Agriculture in Britain in the Present Day." By ANDREW STEUART, M.A., M.P. *Cambridge Essays*, contributed by Members of the University, 1857.

do not possess any good history of agriculture. We neither possess a good local nor a good general history—neither a general one of the husbandry of ancient or modern times, nor one that exhausts the subject in reference to our own country alone. Yet the time is come, we think, when this task might be undertaken with advantage. The subject is now regarded with so much general interest, that such a work would find a sufficient number of readers; and sufficient materials exist for its composition. Separate treatises are to be met with on almost every department of farming; the history of certain eras has been carefully written; and although these are to be regarded as more of the nature of what the French call *memoires pour servir*, &c., than comprehensive histories, the information they afford might readily be combined, systematised, and made available for general purposes. We believe that many local, and even national, practices in this art, are carried on which are unknown to agriculturists in general, although it may be of the greatest importance for them to become acquainted with them for the improvement of their own operations. A well-written history would bring such points, as well as every other which in times past has affected the interests of agriculture, into prominent notice; and results, equally important and unexpected, might be deduced from the survey.

Mr Steuart proposes three objects to himself in treating of modern British husbandry. 1st, To give a sketch of our agricultural progress, and especially for the last hundred years, in our island. 2d, To compare our state with that of other modern nations, and France especially, as the country both most adjacent to our own, and also, next to us, the most advanced; and to illustrate the causes of our own superiority. 3d, To consider how far such comparative superiority is likely to be maintained, and the directions in which we should look, and the aids we ought to hope for, in our expectations of still further progress.

On neither of the two former of these departments of his subject has the essayist elicited much or anything which is not likely to be already known to the majority of our readers. In the second he merely brings forward the views of M. De Lavergne, as given in his treatise on the Rural Economy of England, Scotland, and Ireland, [illegible] institutes a comparison between Britain and [illegible] France. In placing that country [illegible] Britain [illegible] agricultural advancement, we imagine that [illegible] position which would not be claimed for it by M. De Lavergne himself. Although in some parts of that country agriculture has made great progress of late, by far the greater portion is very much in arrear; and Belgium, the Low Countries generally, and some parts of Germany, perhaps even Switzerland, are entitled to the precedence. The principal points on which we are superior to the French, even by their own admission, are "our mechanical skill [illegible] conception and execution [illegible] our adoption

of a better system, by which the produce of several acres of grass and root crops is made to supply manure to each acre under a cereal one; the influence of capital; a large and wealthy body of proprietors and tenant farmers; the security and freedom of our political institutions; our close connection with, and the wealth in, the country, derived from our manufacturing and trading population; to say nothing of other natural advantages—of our coal-fields, and the plodding industry and energy of our people—give us a start in the race which it will take for our neighbours long years of increased energy to enable them to come up with." The third portion of Mr Steuart's Essay, which is by far the shortest, is the only one to which we shall direct attention, referring as it does to the important consideration how we can best maintain the progress and prosperity in agricultural matters which we have been so fortunate as to attain.

The first of these arises from the fact that a large amount of our increased productiveness has been caused by our being able to improve and increase the product of a large extent of ground hitherto producing nothing at all. It is much easier, for example, to raise half-a-dozen quarters of wheat from an acre or two of new land, than to increase the product of twelve acres, we shall say, to eighteen, on ground that has been long in cultivation.

"The greater the progress hitherto, the more will it tax our energy to keep the same advance. And this it was which, looking to the increase of our population and the necessity of keeping pace with it, alarmed the minds of some philosophers—as Malthus and his sect. No doubt, in a highly-civilised country, in any art, a man requires more activity and energy to keep his ground than he did twenty years ago; but there is no reason to suppose that, as such activity and energy are required, they will be wanting. But still, in agriculture, people have made up their minds that new processes are required, and not merely extensions of old improvements. Though there are still many bogs in Ireland and mosses in Scotland, and high ground to be enclosed and sheltered and brought into cultivation, and much heavy clay-land to be thorough drained, yet to all these we see a limit which in a few years might be reached. The chief question, then, is, Are there new agents already appearing in view as means to be employed, with a well-grounded hope of success, to cheapen the cost and increase the amount of production?"

Among these means Mr Steuart ranks first the application of mechanics and steam-power. He states, that it has been remarked, as one of the most hopeful signs of healthy agriculture, that it is hardly to be said that the science of mechanical agriculture is as yet fully understood. It is still a matter of dispute, which of the various reaping-machines is deserving of the preference, and they are very far from having come into general use. Thrashing by steam has not been practised for many years yet, although it is now in very general use. From the Report of the Paris Agricultural Show of 1855, it appears that, in 1851, machines of the aggregate amount of 1349 horse-power were sold by one manufacturer alone; in 1855, 3332. This may probably be taken as an index of the ratio of progress in this particular.

"Some may feel disappointed that as yet the great work has not been fully accomplished of economical steam-ploughing. Many successful trials throughout

the country may be regarded, however, as showing that the invention will ere long introduce a new era into agriculture. Whether Fowler's steam-plough or Boydell's traction-engine is to be the best, we believe there is no doubt that ere long the soil will be turned up to the depth of eight or nine inches at a cost greatly less than the present ploughing by horses at 8s. or 10s. per acre. There are ploughs in operation now in different parts of the kingdom—where, though the inventors and proprietors must have a profit, which the farmer who could buy and use such would save—even now, as around Ipswich, in Berwickshire and Stirlingshire, the work is performed with economical advantage. We saw Fowler's machine at work on a field, certainly under favourable circumstances, where the work of twenty horses per diem seemed fairly done. The cost of the apparatus was about £450, scarcely the original cost of ten horses at present. For wages, tear and wear, and fuel, about 30s. per diem would be sufficient; certainly a saving of about 2s. or 3s. per acre on the head of maintenance alone, to say nothing of original cost. But the greatest advantage will be in ploughing at greater depths than the ordinary plough can go. Here the ratio is constantly increasing in favour of the former; and ere long a cheap and ready means, as to a great portion of the country, will be afforded of deepening the soil and reducing it more and more, as it ought to be, to the state of an extended garden."

The second point from which our author prognosticates further triumph in production, is the means we may possess of turning to advantage a vast supply of materials at present almost wasted, or even pestilential; such, for example, as sewage-manures. This, however, is evidently an influence which can operate only partially and locally, and cannot materially affect the produce of our fields throughout the country.

The consideration from which the most auspicious auguries may be formed regarding future progress, is that which Mr Steuart places last, and which he dismisses very summarily—namely, increased attention to education in all the sciences which bear on the profession of the farmer.

"The farmer," he says, "is now fully sensible of the benefits of chemistry. All enlightened men class the knowledge of the principles of Liebig, which began only some sixteen years ago, as adding equal good to agriculture with the adoption of thorough draining, or the benefits of mechanical science. The Highland Society of Scotland, which has not been the last in many instances to start what is of great practical utility, has of late taken up the subject of agricultural education. Instruction in chemistry is of course indispensable; zoology and natural history are requisite; botany, to know the nature of plants and weeds; geology, to teach the nature of soils; mechanics, of course; and various other branches of which, thirty years ago, a farmer would never have dreamt. In various colleges, at Cirencester and elsewhere—in Ireland—in the chemical laboratories of Mr Way—in the importance attached to chemical investigation—we see the interest excited in the public mind on this subject. Doubtless in this, as in taking other leaves from our books, improving their breeds of cattle, adopting our drainage and root-crop systems, France and others may be able partly to come up with us; but if, as we flatter ourselves, our men of science and native energy do not lag behind the rest of the world in other branches of knowledge, why should we expect them to do so on what is so important a benefit as agriculture?

"Though much still remains to be done, we need expect comparatively but little from present improvements extended. As to the principles of our rotation of cropping, the breed of cattle, and many other points of improved farming, we need expect—as far as at present, with diffidence, we would venture to predict—no great advantage, though certainly some from their more universal application. But the facts, that we have lagged behind our manufacturing brethren in enlightened energy—that they before us have applied all the aids of mechanical and chemical skill—and that the benefits of education in other branches besides the operation of the plough are now at length being seen—are those which give us the

greatest hope when these are diffused more among our agriculturists. Looking at the rate of progress hitherto, and our increased advantages, let us go on—

'Ever reaping something new,
That which we have done but earnest of the things which we shall do.'"

Guano and Superphosphate.—Boussingault and Payen, in constructing their table of the analysis, comparative values, and equivalents of manures—the equivalents being calculated and determined by the amount of nitrogen contained in the manures—declared that, "while recognising the importance, the absolute necessity, of azotised principles in manures, we are far from thinking that these principles are the only ones useful in the amelioration of the soil. It is certain that different salts, alkaline and earthy, are indispensable to the development of vegetables." This was written about twenty years ago, and the truth of it is now acknowledged by all men of science, and intelligent practical farmers. M. Boussingault has read of late to the French Academy of Science some interesting papers on this subject, detailing experiments which were undertaken, he tells us, not with the view of corroborating an opinion so generally received, but of determining, in some measure, the useful effect which "these principles, certainly the most efficacious in manures, exercise on vegetation; the nitrogen either in the form of nitrate or ammonia, and the phosphoric acid in a state of combination as a phosphate." One of these papers has already been translated at length in this Journal.* We do not intend to follow out the same plan with the other papers of M. Boussingault, but merely to give the conclusions at which he has arrived, which will be found to agree entirely with those arrived at by practical men.

The results of the first series of his experiments proved that the free nitrogen of the atmosphere was not assimilable by plants; that nitrogen was as efficacious in the state of a nitrate as in that of ammonia; that the nitrogen was assimilated directly from the nitrates, and not after these nitrates had been converted into ammonia—that, in fact, the nitrates played a far more important part in vegetation than was generally supposed; that the decomposition of carbonic acid by the leaves is in some way subordinate to the previous absorption of a manure acting after the manner of the manure of the farm; that manure may be indifferently ammonia, an organic matter in a state of decay, or a nitrate.

The second and third series of experiments prove—1st, that the phosphate of lime, the alkaline salts and earths which are indispensable in the constitution of the plant, only act on vegetation in as far as they are united with substances capable of furnishing nitrogen that can be assimilated; 2d, That matters having nitrogen that can be assimilated are found in far too small quantity in the atmosphere to determine, in the absence of a nitrogenous manure, an abundant and rapid vegetation; 3d, That nitrate of potash or soda associated with phosphate of lime and silicate of potash, acts as

* No. LII. (New Series), p. 319.

a complete manure; 4th, That matters rich in assimilable nitrogen only act as a manure when associated with the phosphates. "It is somewhat remarkable," adds M. Boussingault, "that a plant will pass through all the phases of vegetable life, will germinate and reach maturity—in a word, will attain its normal development—when its roots grow in calcined sand, containing, instead of the remains of organic matter in a state of decomposition, salts of great purity, whose compositions are perfectly defined, such as the nitrate of potash, the phosphate of lime, alkaline silicates, all drawn from the mineral kingdom, by means of which that plant increases gradually the weight of its different parts, in fixing the carbon of the carbonic acid, and the elements of water, and in elaborating albumen, casein, &c.; that is to say, the nitrogenous principles of milk and muscle."

For some years back, the farmers of this country have been trusting very much to Peruvian guano, which very much partakes of the character of a nitrogenous manure, from the large proportion of nitrogen it contains in comparison with the other ingredients. The results from its application were most satisfactory and profitable. It has been found, however, now that the white crops on those fields on which there has been a recent and several previous applications of guano, are soft in the straw, and do not yield according to bulk, as well as they used to do. In Bavaria where guano has been in use for some years, it has been observed that larger quantities must be given to produce as good results as formerly. The present high price of guano has led farmers to try substitutes for it, both on the white and the green crops, which have proved more profitable in very many instances. There can be no doubt that a moisture of different substances, such as superphosphates, guano, or nitrates, rape, &c., will produce in most instances a more profitable result than Peruvian guano at its present price. Superphosphates in particular, with a due proportion of nitrogenous matter in their composition, have risen greatly in favour as a manure for turnips. To satisfy ourselves as to the economy of using guano or superphosphates, we calculated the cost of a ton of turnips as raised from the one and the other, from experiments we found detailed in several of the weekly agricultural periodicals. We find that the average cost of a ton of turnips from guano in six different experiments, in different parts of the country, is 3s. 2¼d. while the cost of a ton from superphosphates made by different manufacturers, in four different experiments in different districts, is 2s. 2¾d., the manure in both cases only being calculated—labour, rent, &c., not being taken into account. Thus, then, there is a difference of 9½d. per ton in favour of superphosphates; and as the average crop of the experiments was about 25 tons per acre, we have a profit of nearly £1 per acre by using superphosphates instead of guano. In these times of low prices, farmers will consult their own interests by performing similar experiments, and making such calculations as those referred to above.

AGRICULTURAL SUMMARY FOR THE QUARTER.

The same open mild weather has prevailed throughout January and February as during the three previous months. In fact, all the characteristics of genial spring weather have marked that with which we have been visited in these last two months—a slight frost in the morning, bright sunshine during the day, with a balmy atmosphere in the afternoon. Nothing could be better suited than it for bringing the land into condition for sowing, its mellowing influence being felt both by the early and late-ploughed lands. If there is a continuance of this weather to the first week of March, the most of the beans will be sown in the country. Wheat and grass fields, as might be expected, look fresh and green; and much of the stock usually housed entirely at this period, are seen gamboling on the grass. Ewes have begun to lamb, their offspring rejoicing in the open field, instead of being cooped up in a house—the natural place for them in the month of February in ordinary years.

We regret to say that the prospects of the farmer are no brighter now than they were some months ago; on the contrary, there has been a considerable decline in the price of some articles, such as butcher-meat. The continued dulness of trade is no doubt the cause of this; for, while there is no improvement in the manufacturing districts, the dulness is spreading to other places, where it was unknown when we last wrote; and there is no town now of any size which has not its hundreds of unemployed men and women. Another cause has rendered cattle almost unsaleable—viz. that in many districts the turnips have not stood the eating expected, and not a few farmers have been obliged to send their cattle to market before they were quite ready for the butcher. The price of turnips for sheep has also risen very much, owing to extensive dealers keeping up their stock, in the confident hope of a rise in the price, as good sheep are expected soon to be very scarce in England. Taking all circumstances into consideration, we look for high fat markets in the months of May and June. Potatoes are another article that will ere long command a very high price—if indeed they can be got for money—the scarcity of them is so much complained of already.

Societies.—We have little to remark on, possessing unusual interest, as having occurred during the last two months. The general meetings of the Highland and other Societies were held in January. The principal topic brought forward at the meeting of the Highland Society was the intimation by the Secretary that he had ceased to have any farther connection with the collection of the agricultural statistics in Scotland. As we have entered into this in another part of this number of the Journal, we think it unnecessary to say more on the subject at present. The other business of the Society was principally of a routine character. The report of the Agricultural Labourers' Improvement Association, read at its

meeting in January, was very satisfactory: and we quite agree with one part of it, where it is stated that "although the object of the association is primarily architectural, its title implies that, through the improvement of the dwellings of the agricultural labourers, it distinctly aims at raising their moral and intellectual condition." We observe also, from another part of the report, that though the directors have been most assiduous in improving the *cottages* of the labourers, they have not neglected the bothies, which are more prevalent in some districts than cottages. In this we think they have acted with discretion. It cannot be expected that bothies can be abolished for some years in those districts; and the wisest plan is to improve them as far as possible, and to introduce gradually the cottage system as a substitute.

We are glad to find that the subject of cottage accommodation and improvement is exciting so much interest both here and in England. The London Society of Arts has had it brought before them and discussed; and at a meeting of the Architectural Institute of Scotland, held last month in Edinburgh, the subject was ably and practically treated by Mr Gowans, who gave a description of the houses for the labouring classes he had erected both in Edinburgh, and at Redhall quarry, of which he is the lessee. The principal objects which he had endeavoured to secure were—1st, An independent entrance to each house; 2d, Separate access to each apartment from the lobby; 3d, Separate sleeping places for the male and female members of a family, and, in the case of children, separate bedrooms for both sexes distinct from that of their parents; 4th, Water-closet and scullery to each house, with bath in the scullery, which might also be used as two washing-tubs by means of a movable division; 5th, To place the sculleries and water-closets so as to simplify the drainage, one drain only on the outside of the building being necessary; 6th, To heat and ventilate each apartment in a simple and efficient manner. We would have liked Mr Gowans to have stated the cost of erecting a cottage with all the conveniencies mentioned above, supposing him to have accomplished all the objects he had in view in their erection.

The Meteorological Society held its general meeting also in January, at which the report was read, from which we were glad to see that it progresses in its usefulness. An effort has been made to induce Government to bestow its patronage upon it. Another fact mentioned in the report, which must be interesting to agriculturists, is that the Society was engaged in ascertaining the temperature of the soil and subsoil at different depths. The Secretary, Dr Stark, delivered at the meeting a lecture, showing the bearing of the facts ascertained during the past two years on the ...ry of storms, on our insular and oceanic position, the influence of the Gulf stream, the mean temperature of the districts of Scotland. This lecture was rendered very interesting from being illustrated ... elaborate diagrams.

AVERAGE PRICE OF THE DIFFERENT KINDS OF GRAIN,

PER IMPERIAL QUARTER, SOLD AT THE FOLLOWING PLACES.

LONDON.

Date.	Wheat.		Barley.		Oats.		Rye.		Pease.		Beans.	
1857.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
Dec. 5.	50	9	39	3	25	6	30	0	46	1	40	3
12.	51	6	37	11	26	9	33	6	44	0	39	11
19.	50	11	39	11	22	11	34	0	43	2	38	9
26.	49	10	36	0	27	0	32	2	42	10	39	2
1858.												
Jan. 2.	51	3	37	0	26	4	31	10	40	11	37	11
9.	49	11	38	2	25	10	32	4	42	3	38	2
16.	50	5	39	3	26	6	31	6	43	6	37	3
23.	51	3	37	6	25	7	30	8	42	3	37	6
30.	50	8	39	10	27	8	32	0	41	8	37	2

LIVERPOOL.

Date.	Wheat.		Barley.		Oats.		Rye.		Pease.		Beans.	
1857.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
Dec. 5.	48	7	38	6	24	1	30	2	41	2	41	10
12.	49	1	35	5	21	5	29	10	41	4	38	8
19.	46	8	34	8	21	7	29	2	46	0	38	7
26.	48	5	34	10	22	0	28	6	43	6	38	7
1858.												
Jan. 2.	48	3	35	0	23	9	29	4	40	11	40	1
9.	47	2	35	2	23	6	28	10	42	0	41	5
16.	49	6	35	0	23	2	29	3	41	10	40	8
23.	47	10	31	6	22	0	29	6	41	4	39	11
30.	46	2	33	6	23	9	30	1	40	8	39	6

EDINBURGH.

Date.	Wheat.		Barley.		Oats.		Pease.		Beans.	
1857.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
Dec. 2.	39	8	28	2	23	1	37	4	37	11
9.	39	2	26	11	21	11	36	2	36	9
16.	38	11	27	3	21	10	36	6	37	0
23.	39	10	27	11	22	2	35	2	35	10
30.	40	1	27	9	21	7	35	1	35	9
1858.										
Jan. 6.	41	5	28	9	22	1	36	6	37	3
13.	41	2	28	7	22	9	36	8	37	1
20.	40	5	27	8	22	11	36	7	37	2
27.	40	6	28	11	23	0	36	9	37	5

DUBLIN.

Date.	Wheat, p. barl. 20 st.		Barley, p. barl. 16 st.		Bere, p. barl. 17 st.		Oats, p. barl. 14 st.		Flour, p. barl. 9 st.	
1857.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
Dec. 4.	27	9	16	7	14	2	13	4	20	6
11.	27	0	16	9	14	4	13	0	20	5
18.	27	2	16	8	14	8	13	6	20	5
25.	27	6	16	10	14	4	13	9	20	6
1858.										
Jan. 1.	27	5	16	9	14	5	13	7	20	4
8.	28	0	17	3	14	6	13	6	20	7
15.	27	4	17	6	14	8	13	6	20	8
22.	28	0	16	6	14	9	13	0	20	6
29.	28	6	16	11	15	1	13	8	20	10

TABLE SHOWING THE WEEKLY AVERAGE PRICE OF GRAIN,

Made up in terms of 7th and 8th Geo. IV., c. 58, and 9th and 10th Vict., c. 22. On and after 1st February 1849, the Duty payable on FOREIGN CORN imported is 1s. per quarter, and on Flour or Meal 4½d. for every cwt.

Date.	Wheat.				Barley.				Oats.				Rye.				Pease.				Beans.			
	Weekly Average.		Aggregate Average.		Weekly Average.		Aggregate Average.		Weekly Average.		Aggregate Average.		Weekly Average.		Aggregate Average.		Weekly Average.		Aggregate Average.		Weekly Average.		Aggregate Average.	
1857.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
Dec. 5.	48	3	51	3	35	9	39	11	23	0	24	7	32	9	34	11	40	0	42	11	41	2	43	10
12.	49	5	50	6	36	5	38	10	23	3	24	3	34	1	34	5	41	2	42	2	41	1	43	2
19.	49	3	49	11	37	0	38	0	22	8	23	8	35	7	34	4	40	5	41	7	40	3	42	4
26.	47	5	49	3	35	11	37	1	23	2	23	4	31	6	33	10	40	9	41	1	39	7	41	6
1858.																								
Jan. 2.	47	7	48	7	35	10	36	5	22	3	23	0	32	1	33	4	39	4	40	5	39	3	40	9
9.	47	10	48	4	36	3	36	3	22	8	22	10	33	6	33	3	40	5	40	4	39	3	40	2
16.	48	8	48	4	37	0	36	5	22	1	22	8	33	7	33	5	39	11	40	4	39	3	39	9
23.	48	9	48	3	37	6	36	7	22	4	22	6	32	0	33	0	39	5	40	1	39	4	39	6
30.	47	6	48	0	37	1	36	7	23	1	22	7	34	10	32	11	40	4	40	0	39	5	39	4

FOREIGN MARKETS.—Per Imperial Quarter, free on board.

Date.	Markets.	Wheat.	Barley.	Oats.	Rye.	Pease.	Beans.
		s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.
1857. Dec. ?..	Danzig	40 0 - 50 0	20 6 - 24 6	15 6 - 23 0	26 6 - 32 0	32 0 - 40 6	34 0 - 40 6
1858. Jan. ..	Danzig	38 0 - 45 6	22 9 - 29 0	16 6 - 25 0	28 0 - 33 0	28 6 - 34 0	32 6 - 38 6
1857. Dec. ..	Hamburg	37 6 - 44 0	21 6 - 26 6	16 6 - 25 0	25 6 - 33 6	31 6 - 38 6	27 6 - 31 6
1858. Jan. ..	Hamburg	38 6 - 47 0	24 6 - 29 0	17 0 - 26 6	24 6 - 33 3	30 0 - 36 0	28 6 - 35 6
1857. Dec. ..	Bremen	41 6 - 50 6	26 6 - 32 0	15 6 - 23 0	26 6 - 36 0	32 6 - 39 0	28 6 - 35 0
1858. Jan. ..	Bremen	38 6 - 48 0	24 6 - 30 6	15 0 - 23 6	25 6 - 35 0	30 6 - 36 0	29 6 - 36 6
1857. Dec. ..	Königsberg	38 6 - 45 0	23 6 - 30 6	14 6 - 23 0	25 0 - 35 0	40 6 - 50 0	30 6 - 38 6
1858. Jan. ..	Königsberg	36 6 - 46 0	22 6 - 28 6	15 0 - 24 0	24 0 - 33 6	38 0 - 47 6	31 6 - 40 6

Freights from the Baltic, from 2s. 6d. to 4s. 6d.; from the Mediterranean, 9s. 6d. to 12s.; and by steamer from Hamburg, 3s. 6d. to 5s. per imperial qr.

THE REVENUE.—From 1st October to 31st December 1857.

	Quarters ending Dec 31. 1856.	Quarters ending Dec 31. 1857.	Increase.	Decrease.	Years ending Dec. 31. 1856.	Years ending Dec. 31. 1857.	Increase.	Decrease.
	£	£	£	£	£	£	£	£
Customs	6,232,175	5,590,018	..	642,157	23,618,375	22,464,352	..	1,154,023
Excise	4,816,000	4,769,000	..	47,000	18,073,778	17,472,000	..	601,778
Stamps	1,838,000	1,761,000	..	77,000	7,268,272	7,269,223	951	..
Taxes	1,356,000	1,361,000	5,000	..	3,105,026	3,104,020	..	1,006
Post-Office ..	748,000	810,000	62,000	..	2,869,152	2,992,000	122,848	..
Miscellaneous	281,842	807,707	525,865	..	1,255,773	1,950,750	694,787	..
Property Tax	1,423,464	808,437	..	615,027	16,028,422	15,137,997	..	890,425
Total Income	16,695,481	15,907,162	592,865	1,381,184	72,218,798	70,390,342	818,586	2,647,232
	Deduct increase....			592,865	Deduct increase....			818,586
	Decrease on the qr.			788,319	Decrease on the year			1,828,646

PRICES OF BUTCHER-MEAT.—Per Stone of 14 Pounds.

Date.	LONDON. Beef.	LONDON. Mutton.	LIVERPOOL. Beef.	LIVERPOOL. Mutton.	NEWCASTLE. Beef.	NEWCASTLE. Mutton.	EDINBURGH. Beef.	EDINBURGH. Mutton.	GLASGOW. Beef.	GLASGOW. Mutton.
	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.
1857. Dec. ..	6 9 - 8 3	7 6 - 9 4	5 9 - 7 9	6 6 - 8 0	5 6 - 8 0	6 0 - 7 9	6 0 - 7 6	6 3 - 8 3	6 6 - 8 0	6 9 - 8 3
1858. Jan. ..	6 6 - 8 0	7 6 - 9 0	6 0 - 7 6	6 3 - 7 6	5 6 - 7 6	6 3 - 8 2	5 9 - 7 3	6 0 - 8 0	6 3 - 7 9	6 6 - 8 0

PRICES OF ENGLISH AND SCOTCH WOOLS.—Per Stone of 14 Pounds.

ENGLISH.	s. d.		s. d.	SCOTCH.	s. d.		s. d.
Merino,	20 6	to	26 6	Leicester Hogg,	20 0	,,	24 6
.. In grease,	17 0	,,	22 0	.. Ewe and Hogg,	16 0	,,	22 0
South-Down,	20 0	,,	25 6	Cheviot, white,	15 6	,,	20 0
Half-Bred,	15 6	,,	20 6	.. laid, washed,	9 6	,,	15 0
Leicester Hogg,	18 0	,,	25 0	.. .. unwashed,	8 6	,,	12 0
.. Ewe and Hogg,	16 0	,,	22 0	Moor, white,	8 0	,,	11 6
Locks,	9 6	,,	12 0	.. laid, washed,	6 9	,,	8 6
Moor,	7 0	,,	9 0	.. .. unwashed,	5 9	,,	7 0

A FEW THOUGHTS AND FACTS ANENT TURNIPS.

The turnip is the chief corner-stone on which is laid that beautiful system of modern farming that provides food for the flock, manure for the land, and bread and meat for the people. It is the best possible crop for cleansing the land, and for reducing it to that tilth which fits the soil for the reception of all the enriching constituents which well worked and pulverised soils can draw from the air. It is also the crop of all crops in which the advantages of modern science in connection with farming have been most conspicuous. To this crop it is that the principles of chemistry have been applied with such precision as to fix specifically *the* manure, and the quantity of manure, that a crop requires. Its specific manure, too, has done more for the improvement of farming than any other single discovery; for it is unquestionable that the application of superphosphate to root crops, by producing larger bulbs, maintaining more sheep than usual on a given quantity of land—giving, therefore, a value to the root crop that it never before possessed—has laid the foundations of high farming, and encouraged the cultivator of the soil to proceed in his experiments and inquiries. What a beautiful subject for reflection is it, that, in the wise economy of Nature's workings, the bones of the animal that derived its strength and nourishment from the turnip—the very refuse, flung aside after the flockmaster has had food and raiment (*i.e.* mutton and wool) from the animal—shall form the chief ingredient in *another* crop of roots, a *second* flock of sheep, a *second* yield of wool! Investigating minds may observe the same perfection and beauty, the same economy of working in the operations of other natural laws, such as in the air we breathe and the water we drink. Thus the rain from heaven percolates and enriches the soil, and bursts up filtered and freshened in the grateful spring, trickles into the mill-stream, swells the brook and the river, and, falling into ocean, is drawn up again in insensible humidity by the wind and the solar rays, again to descend in fertilising showers. For so humble, and we almost say vulgar, a vegetable, it has a glorious pedigree, and divines and philosophers might well make it the theme of pious reflection and elaborate research; but our business is with its common unpoetical life. We leave its ancestry to be traced by others.

To ascertain, however, its keeping qualities, we must take up its history even before the germination of the seed. It is a well-ascertained and settled fact in animal life, that healthy and vigorous growth is scarcely to be expected from unhealthy progenitors, or in a puny and sickly offspring; and it is equally certain that, unless we begin with good seed, our chance of securing a turnip

crop, to say nothing of "keeping" it, is but a precarious one. Nothing will impress this fact with greater force than the discovery that what is termed "fingers and toes" in turnips is not so much a disease, in the ordinary acceptation of the term, as a disposition upon the part of uncivilised members of the tribe to return to their original wild state. The turnip, in its best form, is but a hybrid. In its wild condition it is "an annual, with a disposition to bulboid growth." Under good cultivation it becomes a biennial, with monstrously-developed roots. It belongs to the genus Cabbage, and it requires no great stretch of the imagination to trace its genealogy upward through rape to the parent head of the Brassica family. The swede of the present day is a civilised, substantial, and respectable member of agricultural society, compared with his wild and ragged progenitors; but as there is in all families, in some generations, a wild spark, so is it in the vegetable world, and occasionally we meet with an untrained and headstrong root, which will run wild, and send half-a-dozen feeble roots in all manner of directions. All that exhibit this mark of degeneracy should be at once removed, for their seed will be even more degenerate; and hence it is a bad practice to leave a portion of a field of roots to seed as they stand. Careful selection of roots will alone secure good seed. Sometimes the pollen of an adjacent flower touches the stigma of the turnip, and a hybrid is the result. How far the diseases of turnips are influenced by this, it is perhaps difficult to say with precision, for we see that a hybrid has produced the finest and best roots we have; but there is little doubt that, if the perplexing diseases which sometimes lay bare whole fields of turnips in an unaccountable manner could be traced back to their origin (bad seed), weakly growth and vagrant dispositions would be found to have much to do with them.

To a healthy development of this root a free soil is necessary, for the immense roots seen in our show-yards displace a considerable quantity of soil, and unless it be in a loose and movable condition, the plant is crippled, and its tiny rootlets are impeded in their search for nourishment. Roots, therefore, can attain a larger growth in light land than on heavy soils. As grass will grow under a stone, so the root will grow in *some* way even when it has to battle for place with a stubborn clay-soil. It would be interesting to trace how far mechanical impediments have helped to [illegible]oduce the different shapes of turnips that exist, from a tankard [illegible]nowball. The form of the root is not without effect on its [illegible]eping qualities, for turnips that grow much out of ground, or [illegible]ave long necks, are not so well adapted to withstand inclement [illegible]eather as those which obtain more protection for their roots.

[illegible]f all cultivated crops the turnip requires most a good start in [illegible]rld. Th[illegible] [illegible]nfant plant contains within it the germ of all [illegible] though natur[illegible] does a good deal towards heal-

ing wounds and remedying defects of growth, it cannot but happen that the young plant, which has been maimed by the fly, the slug, or the caterpillar, must have a more precarious progress towards maturity than an uninjured plant. A highly stimulating and forcing manure, to send it beyond reach of the fly, is therefore a condition precedent to its keeping qualities; so also are freedom from anbury, mildew, and other atmospheric affections. It is within our province, therefore, to glance briefly at some of the efforts that have been made to cure the diseases and attacks to which growing turnips are subject.

For the destruction of the fly and other insects numerous remedies have been suggested—soot, lime in early morning, the drawing of furze and bags over the young plants; but these are the remedies of cure, not of *prevention*. The encouragement of rooks and other insectivorous birds, and the destruction of weeds in which insects delight to shelter, are among the most modern and most feasible recommendations. For the disposition to fingers-and-toes, care in selecting good specimens for seeding, and the use of lime on sour soils, have been found remedial. Late-sowing is one safeguard to mildew, and the use of the horse-hoe, and keeping the land clean and open, although they cannot prevent adverse atmospheric influences, give the plant greater vigour for contending against them.

We have laid particular stress upon the healthy condition of the plant, because we have always found that vigorous specimens of a less favoured class, either in animals or vegetables, will excel in many qualities the ordinary specimens of a class which is ranked above them. This is peculiarly the case in the dairy, where, although the Ayrshire or Channel Island breed may, *as a breed*, be better milk-producers than the old herds of this country, the Hereford, the Yorkshire, and the Devon, we yet find individuals of all these latter species producing as much milk certainly as the ordinary specimens, and sometimes as the best specimens of the former breeds.

This naturally leads to the remark, that of no one kind of turnip can it be said that it possesses the best keeping qualities. One sort is found to answer well in one locality, and to disappoint in another; to be all that could be wished in one soil, or under one condition of climate, and to be most inferior on a neighbouring farm, or in another year. I am going from generalities to particulars. The turnip which is most commended for keeping qualities in my county is the *old green-top*. An account of this root appears in the *Journal of the Royal Agricultural Society*, xv. 404. I have inquired whether, after the experience of two more years, this turnip still maintains the high character which is there given to it, and two practical farmers declare that it is all that it is represented to be; whilst a third correspondent, a chemist and agricul-

turist of no mean renown, writes: "The turnip deserves the character given it for endurance of frost, but that is its sole recommendation; for the bulbs are contemptible not only in respect of size, but in the shape and quality of root. It is *on my soil* a hybrid of the worst character." In the same county, a swede called the Sussex or Wyatt's is creeping into favour; and a flockmaster observes of them, "The sheep are very fond of them, and prefer them to Skirving's, but the one does (for fattening purposes) equally as well as the other." The gentleman to whom I have before referred, prefers the winter Lothian, a yellowish-fleshed variety, which he holds in greater favour than the old green-top, although the winter of 1854–5 killed most of the crop, an event which never happened to him before. These are instances taken from one county, from gentlemen who are all first-class farmers, and who reside not many miles from each other. No doubt, such instances could be multiplied indefinitely, and a long catalogue of varieties of turnips, famed for keeping qualities, be provided for one district, that would be found unsuitable for others.

The writer, therefore, does not pretend to claim pre-eminence for any one particular sort, but the old green-top has been found so useful and enduring that a detailed account of its culture and storing can neither be unprofitable nor out of place.

This sort is sown by Mr Thomas Homer Saunders of Watercombe, Dorset, through the month of June, preference being given to the middle of the month, if the land is in good order. About three bushels of home-made superphosphate and two sacks of half-inch bones, with three dung-put loads of pigs' dung and road-scrapings, are drilled in per acre. The early sown are double as liable to rot as the late sown, and of all artificial manures Mr S. has found the root rot most where guano has been applied. When the greens are from 6 to 8 inches long they are mown off—at least those required for feeding in April and May, for they are found to keep much more healthy in ground than in heaps. This process retards the growth of the plant, which puts forth its energies again when other roots have ceased to grow. "They grow," says Mr S., "all the winter, except in very frosty weather. I once took up some about Christmas for the beasts, in case frost might set in; they remained until February, when I had some more from the adjoining ridge of land carted and put down by the side of them, and to my surprise I found them half as large again, and since that time I have always noticed their growth during the early part of winter." It is, therefore, not recommended to store them early, but for the early part of winter to feed from earlier and larger varieties, such as Skirving's or the Sussex. Two pieces of swedes in the same field—the old green-top and the Sussex growing side by side—were weighed on the 22d of February of last year, and the Sussex were found to exceed the green-top in weight by above

2 tons an acre; but the former were then getting soft and spongy, whilst the latter had "not one unsound one out of a hundred." In March and April last, a field with a northern aspect was as well stocked with greens as in ordinary winters, whilst here and there around the turnip-fields looked like fallow. Another farmer, whose land is much exposed, says his sheep would have been starved one winter but for the old green-top.

This practice of mowing turnips to improve their keeping qualities excited some curiosity when it was first made public, the opinion being entertained by some that this proceeding was the very course of all others calculated to induce sponginess of the interior of the root and a stringy exterior; but the same practice was followed some years ago by Mr Smith of Lois Weedon, who stated that, before his swedes had reached their full growth, he cut off the tops about half an inch from the bulb, and that the bulb had by proof continued to grow, and had thrown out fresh leaves all round the crown; and, moreover, that the root had not been injured perceptibly by this process. The process, he adds, is not original, but was tried with success in Scotland; and upon analysis it was found that the root so treated differed only from others of its kind, not so treated, in containing one per cent of water.

That the size of turnips bears some relation to their keeping qualities appears to have been noticed many years ago by Mr Stevenson, who, in his *General View of the Agriculture of the County of Dorset*, drawn up "for the information of the Board of Agriculture and General Improvement," in 1812, observes, "Many farmers are lavish in their praises of the excellence of small turnips, and some of them contend that their white turnips will grow so large as to be in great hazard from the frost." This idea would seem to hold good for individuals, and not for classes. An enormously-developed root from a small parent stock generally exhibits inferior qualities, but the labours of seed-growers show that propogation from the finest and healthiest individuals of a class, continued from one generation to another, will produce plants or fruit possessing in an eminent degree size and quality. Where these can be combined, Mr Davy offers an ingenious reason for preferring the largest roots that can be obtained—"Turnips considered as spheres or balls are in proportion to each other as the cubes of their diameters. When the diameter of the turnip is doubled, the solid contents of the turnip are increased eightfold. When the diameter is trebled, the size of the turnip is increased twenty-sevenfold. A practical proof of the fact was afforded by taking three turnips, measuring their diameters, and ascertaining their weights. A root with a diameter of 3¾ inches was found to weigh 1 lb.; another, with a diameter of 4⅚ inches, 2 lb.; and a third, with a diameter of 6 inches, 4¼ lb.

The simplest and most general method of keeping turnips—that of storing them before the setting in of frost—is declared by an agriculturist of high chemical attainments to be "the real secret of preserving roots for spring use." No better plan can be recommended where they are wanted for stall-feeding, but where they are required for sheep, greens are wanted for the lambs to run ahead into in the spring, and the fold is in too much request to be given up even for the best artificial manures. A very convenient and useful combination of systems of feeding is obtained in this way. One-half of the field is drawn and stored on the land, the other half remaining. The fold is begun in the middle of the field, and the flock is fed from one side or the other, according to weather, eating the stored in frosty weather, and the standing crop at other times. Where part of the crop is required to be drawn for house-feeding, one-half the drill is charged at sowing-time with the old green-top, and the other half with an earlier and larger sort. A four-rowed drill, turned at the end of the furrows, will leave four rows of each sort growing together. The early sort are carted off, and the green-top left. Mr Saunders' plan of storing, "the best for keeping out frost," is this: A labourer with a hoe cuts off the greens as they stand, another removes the roots carefully with a large pecker, taking care not to bruise or injure them. If the land is not wet, a plough-furrow is struck out each way, about four or five perches apart; the roots are thrown in, and a very little straw shaken over to keep them clean. A furrow is then thrown on each side the rows, and a man shovels the dirt to the top. Where turnips are stored together in large heaps, they are apt to rot, especially if no provisions are made for the ventilation of the heap. Gardeners, in storing apples for winter, allow them to remain some days uncovered, that evaporation or sweating may take place unchecked; and after this they are found to sustain variations of temperature that in their green condition would have caused them to rot. The same principle is found to obtain in the storing of roots, which ferment and rot if covered up too early. The general plan of storing between hurdles thatched, though affording means for the escape of evaporation, is found unsafe if too many roots are collected together. They should either be stored in small quantities, or ventilators left in the thatch. It is believed to be not generally known among farmers, that a swede pulled up and laid uncovered upon the land, will keep better through hard winter than those that are left in the soil. In the last winter, turnips pulled up and left on the land uncovered were found uninjured, whilst those in the land were spoilt. Something like this plan was spoken of many years ago by Mr Stott, who says: "I have seen a plan adopted, and which I frequently make use of myself, to preserve [illegible] from spoiling, and to prevent the top from running up to [illegible] the spring [illegible] the month of February or March, or as soon

as the tops begin to shoot up, women are employed to draw the whole crop, and set the turnips down again upon the land where they grew; this prevents their running to seed-stems, and the roots will remain good, though, if they continue long before they are eaten, they will become a little shrivelled; but so long as sheep or cattle can get at any of these roots, they will not touch any of those which are fresh, and which have not been drawn." Mr Stott adds, "This practice also prevents the turnip from drawing and otherwise injuring the land at that season of the year."

The preceding observations have been based upon the practical experience of very good farmers, but I was anxious to add to them the opinions of scientific men upon at least one branch of the subject under consideration, viz. the action of frost upon the turnip. The flowers and fruits of vegetables are amongst the best radiators of heat, and after an unclouded sunset they lose the heat which, during the day, they have drawn from the sun, and their temperature falling below that of the air, the moisture of the air is condensed —in warm weather in the form of dew, in cold weather in the form of frost. Meteorologists distinguish between the depositions that result from a loss of temperature in the air, and those which fall upon such substances as are good radiators, from radiation of heat. To the latter, Lardner ascribes the injury done to the crops of the farmer and gardener by the frosts of spring and autumn. "The foundation of frost," he says, "proceeds, generally, not from the congelation of moisture deposited *from* the atmosphere, but from the congelation of their own proper moisture by the radiation of their temperature caused by nocturnal radiation. The young buds of leaves and flowers in spring, and the grain and fruit (and roots) in autumn, being reduced by radiation below 32°, while the atmosphere is many degrees above that temperature, the water which forms part of their composition is frozen, and blight ensues." The crystals of ice arrange themselves at angles occupying considerably more space than the particles of water. This is given as the explanation why hoops of casks and pails are sometimes burst by the freezing of the surface of the water that they contain; and it certainly does seem a reasonable idea of the effects of frost upon turnips, that these crystals are deposited within cuts or injuries upon the root, or in the petiole heads of long-necked varieties—that these occasion a rupture of the cells—and that, on the application of wet, mildew and putrefaction ensue. This might afford an explanation of the fact, that it is not apparently frost, but wet following frost, that does such injury to the turnip store; and it also explains why it was that a friend of the writer, who stored some swedes, with their roots cut off, with some that were uncut, found his cut roots unsound, and the others perfectly good. The opinion here advanced the writer has sought to strengthen by the judgment of one of the most celebrated of living vegetable physiologists,

who, in reply to the writer's inquiries, observes: "It has been asserted frequently that the cellular tissue of plants affected by frost is ruptured by the expansion of the fluid in their cells, consequent on the action of frost. This is now, I believe, held to be an error. No trace of such rupture is visible in such tissues, where perhaps it would not be a very easy thing to ascertain the existence of a rupture, suppose there were one. Such tissues are very elastic, and will bear a considerable strain; and it must be remembered water expands only at first, contracting as the cold increases, so that, if the cells can endure the first strain, they will be able to resist as the frost increases. It is obvious that the tissues cannot be ruptured in those cases where the contents of the cells are frozen into a solid mass, and yet, after the gradual return to a higher temperature, recover their vitality. They could not do so if they were ruptured. The vitality of the cells varies extremely in different plants. Where once vitality is overthrown, decomposition will soon follow, as is notorious in plants that have been killed by frost. I have carefully examined the roots of Swede and Norfolk turnips. It is not to be expected that in those which are mere modifications of roots, a distinct separate cuticle is to be found, like the skin of the potato. There are two and sometimes three layers of horizontal cells in both kinds of turnips, overlying the general mass of cells of which the root is composed. In the swede these are certainly rather stronger than in the white turnip, but there is no true cuticle — nothing, so far as I can see, to make the one resist frost rather than the other, except that the walls of the swede are a shade stronger. These layers of muriform tissue can afford little if any resistance to frost, for there is no thick true cuticle. Both the roots are liable to be completely frozen; but the swede, if thawed in the shade, recovers its vitality, which is not the case in general with the white turnip. In the former case the vital powers of resistance to the effects of frost are far more intense than in the latter; but why it is so, no man on earth can tell, and probably it will remain a secret for ever. And, after all, put it in as scientific a garb as you may, you will arrive not a line nearer to the fact, that swedes do not suffer so much from frost as white turnips. Wherever the vitality of the cells and their contents is overthrown —for the contents of cells are endowed with life equally as the blood as which circulates in our veins — chemical decomposition at once ensues with more or less rapidity. The starch is converted into sugar, and the cellulose of the cell walls, together with some of the contents, are converted into those ulmates and humates which are always found in decaying vegetable tissues. In the potato the cellulose has great powers of resistance, and the tubers are therefore available where the degree of cold has not been very intense, and are distinguished, as is well known, by a sweet taste and slightly altered tint. I know of no strict comparison between the

chemical condition of sound and frostbitten roots, nor should I conceive that it would be very different from a case of decay from other causes. The accession of moisture after frost accelerates decay, as is almost always the case where life has ceased to control the chemical processes. The first effects of frost, however, are beneficial, so far as it thaws the root slowly; for in all cases where vitality has been suspended, it ought to be slowly restored. Where death has actually taken place, water only aggravates the evil." L. H. R.

COAL, SMOKE, AND SEWAGE.

SUCH is the title of a small pamphlet, "being the substance of a paper read before the Literary and Philosophical Society of Manchester" by Mr Spence. The last of the subjects of which Mr Spence treats, viz. sewage, gives it a claim to be noticed in an agricultural periodical. But what connection, it may be asked, has coal and smoke with sewage? The former we raise from the bowels of the earth, and, after making use of it, send the greater part of it in the form of smoke as far up into the clouds as we can get it, while we carry our sewage by means of subterranean drains into the nearest rivers, and thus as far out into the sea as it is possible to float it. But we will show that Mr Spence proposes to connect them in such a way as to convert what are now two great evils in a crowded city, smoke and sewage, into a great good, which shall be profitable to the citizen and valuable to the agriculturist.

The sewage question has been so fully treated in recent numbers of this Journal that we do not intend to touch upon it here, saving in connection with *smoke.* No subject has met with more attention, and undergone more discussion, of late, than sewage; and yet its problem is still unsolved. The general opinion appears to be, that no plan has yet been proposed by which, considered economically and agriculturally, it can be profitably made use of. In most of the discussions, the *cui bono*, or rather the pounds, shillings, and pence view of the question, has been too much regarded, to the exclusion of its sanitary aspect. From the first moment that sewage matter enters the drains, decomposition commences, and along its whole course to the rivers, noxious and foul vapours are given off, which find an outlet at every grating in the streets, and poison the air which is breathed by the inhabitants. In none of the plans proposed has any attempt been made to make these vapours innocuous or profitable, though in some it is proposed to arrest their production altogether, about

the success of which we have very great doubts. Every other view of the question should be made subordinate to its sanitary aspect; and many, now seeing the necessity of getting quit of the sewage as soon as possible for sanitary reasons, and feeling satisfied that none of the schemes proposed for utilising it can be successful, have joined in the sweeping condemnation of them all by exclaiming, "Away to the ocean with the sewage!"

Preparatory to describing, and for the better understanding of Mr Spence's proposal for the utilising of sewage, we will make some remarks on Coal and Smoke. Ordinary coal contains hydrogen, oxygen, carbon, sulphur, nitrogen; and ashes, consisting of silica, alumina, oxide of iron, &c. As Mr Spence has confined his remarks to the coal, smoke, and sewage of Manchester, we will do the same. Of the above elements 24 per cent of volatile carbon, and 58 per cent of fixed carbon, are found in the coal usually consumed in Manchester. When this coal is thoroughly consumed, which cannot be accomplished without heat and an ample supply of oxygen, the products are water, carbonic acid, and sulphurous acid, which are carried up the chimney, and ashes which remain behind. Of these products water is quite innocuous, but the other gaseous bodies are highly deleterious to health: carbonic acid gas is the cause of those fatal accidents which occur in old wells and pits, at the bottom of which it often accumulates in considerable quantities, and it is the dreaded choke-damp of miners; it is also the cause of the accidents which occur in breweries and distilleries to men going into empty vats. Being heavier than air, it may be poured from one vessel to another, and lies insidiously at the bottom of the wells, pits, vats, &c., and causes asphyxia in animals which enter into any place containing it. Hence, when it issues from a chimney, it tends to sink, from its greater weight than atmospheric air, to a much lower level—in fact, to the strata of the atmosphere in which the inhabitants live. No doubt the power of diffusion of gases may prevent its producing those fatal consequences which it does when in a pure state; but were thorough combustion completely carried out, as the smoke-consumers desire, in large manufacturing towns, this gas would be found mingled with the air the inhabitants breathe, in larger quantity than would be safe for their health.

Sulphurous acid, the other gaseous product of the thorough combustion of coal, is also heavier than air, and even than carbonic acid gas, and is destructive of animal and vegetable life. We knew of a case where a tile-work was erected, and the coals used for the engine containing a large proportion of sulphur, the vapours issuing from the chimney were so injurious to the crops in the immediate neighbourhood of the work, owing, it was thought, to the sulphurous acid they contained, that annual damages were awarded to the farmer to whom the lands belonged by the proprietors of

the work. These, then, are the noxious gases which would be produced from the perfect combustion of coal, were the advocates for the consumption of smoke to gain, by inventions and acts of Parliament, all they want. But it may be asked, are the dense volumes of smoke which are vomited forth by our thousands of chimneys not as prejudicial to health, and even more so, than the almost invisible gases which issue forth from them, when the combustion is more complete? Do they not contain as deleterious gases as carbonic acid and sulphurous acid gases?

We will now proceed to answer these questions by describing the ordinary combustion of coal in our open fireplaces and our furnaces. It requires no great amount of science to make us understand that, when we see dense volumes of smoke issuing forth from our house and manufactory chimneys, the coal in the fires below is not thoroughly consumed. Mr Spence tells us that in its decomposition by heat there are two processes, viz. those of distillation and of combustion. The distillatory process is the same as what takes place when coal is decomposed by heat in closed vessels and retorts. When an open or furnace fire is low, and newly fed with a considerable quantity of coal, a whitish vapour is seen to rise from it; this is simply the evaporation of the water that was on the coals. Then the pieces of coal are heard to crack and fall asunder, and a yellowish vapour ascends, containing ten or eleven different substances, to all of which chemists have given learned names, but which it is unnecessary for us to mention here. By stirring the fire, the distillatory process is carried on more rapidly, the products of which burst into flame, which increases, spreading over the surface of the coals: much of the carbon is given off at this stage of the process, a little in the form of carbonic oxide or acid, but most uncombined with the oxygen in the form of soot, when the yellow smoke becomes black. As the heat increases, and abundance of air is admitted, the fire becomes a live mass, and a blue lambent flame is seen playing over the surface, which is said in Scotland to be a sign of frosty weather, but is, in fact, nothing else but the combustion of the carbonic oxide, or its conversion into carbonic acid. It is only at this stage that the process of distillation ceases and that of combustion begins, no smoke being observed because all the carbon is converted into carbonic acid, and all the sulphur into sulphurous acid, the products of thorough combustion. Such is the progress of the decomposition of coal by heat in our open fireplaces.

The same processes take place in our furnaces, though far more rapidly; and Mr Spence describes the results of the decomposition of coal, before it reaches that state so much desired by our smoke-consumers, in the following words: "Economically, we obtain the full equivalent of heat from the hydrogen gas, but in most cases all the volatile carbon is escaping without yielding any heat

at all; and wherever the deficiency of oxygen is so great as to necessitate the decomposition of the carbonic oxide, to that extent a portion of the fixed carbon is also escaping, without yielding any equivalent of heat; while the other portion of fixed carbon, volatilised by combustion during this portion of the process, is escaping as carbonic oxide gas, and thus yielding less than half the heat it would yield as carbonic acid gas." This theory of the combustion of coal in some measure explains the great waste of fuel which takes place in our manufactories. Theory alleges that 1 lb. of the coal consumed in Manchester, should, if thoroughly consumed, evaporate 12 lb. of water at 160° Fahr.; but from experiments made, it is found that in practice not more than the half of this effect is produced.

We are now in a position to understand the sanitary view of the question. The products of the distillatory process in our furnaces—that is, when the black smoke is seen issuing from the chimneys—are nitrogen, water, carbonic oxide gas, carbon as soot, sulphur and carbonate of ammonia. "Of these constituents of the smoke," says Mr Spence, "only one is of a character positively deleterious to health; nitrogen gas is purely negative, and is not altered by passing through the fire. The water needs no defence; the solid carbon, against which all the cry is raised, is guiltless of any deleterious effect on human health, is one of the most antiputrescent bodies, and while floating in the atmosphere does all that it can to arrest and destroy noxious and miasmatic vapours. Sulphur, again, in its solid form, is perfectly innocuous. The only objectionable body is the carbonic oxide gas; this is certainly poisonous, being equal, in that respect at least, to carbonic acid gas. It has, however, this advantage, that while carbonic acid gas has a specific gravity of 1.52, air being 1.0, the specific gravity of carbonic oxide is only .96; it is thus not only aided in its escape by the law of diffusion, but its lightness always prevents it from any tendency to descend to the human dwellings around." Having thus stated clearly the results of thorough combustion, which the sanitary smoke-consumer wishes to accomplish, and of ordinary combustion of fuel in our furnaces, Mr Spence asks him to make his choice: "Will he consent to have from every 100 lb. of coal, during the distillatory stage of combustion, 29 lb. of poisonous carbonic oxide gas, prevented by its levity and the law of diffusion from invading the lower regions of the atmosphere, [illegible] at the same time bear with the black smoke which confines its [illegible]vages to the destruction of the purity of his linen; or will he [illegible]hoose instead, 163 lb. of heavy carbonic acid gas, descending [illegible] him by its specific weight, despite the law of diffusion, and [illegible] poisonous in its character that it is an ascertained fact that [illegible] per cent of it diffused in the atmosphere is immediately destruc[illegible] [illegible] animal life."

We have now reached that part of the subject which is most interesting to, and concerns most, the agriculturist. How can these matters which poison and pollute the air of the inhabitants in the towns, be turned to the most profitable account on his behalf? How can those substances which fester beneath the townsman's feet, and send forth their pestilential fumes, be made available for his farm? We have already said that the sewage problem is yet unsolved; but this owing not to its containing useless matter, but because a means of rendering it profitable has not yet been devised. Not one particle of matter was created to be wasted, or without having its own proper use. The disintegrated crumbling rocks are reduced to that state simply that the elements of their composition may be more readily made use of by plants; these again afford nourishment to animals, or die, decay, and give birth to more of their own species, or form the main support to vegetation generally. Animals in their turn yield food to man, or to other species of the same kingdom, die, and from their putrefying remains rise some of the most beautiful flowers or the most useful vegetables; while man is no exception to the general rule: he lives, he flutters through his short and busy period of existence here; he returns to his dust, to be the prey of the worm; or his remains may have escaped the ravages of the tiny insect for thousands of years, only to be broken up and used for fuel by his own descendants or strangers, as is done with the mummies in the East at this moment. We are still hopeful that ere long the prevailing opinion will not be to sweep our sewage matter of the towns to the ocean, but that the farmer will find in it a good, useful, and cheap manure: it is a principal part of his duty to carry out and aid these processes of nature which we have been describing, and he now asks the man of science and the inhabitants of the towns to assist him in putting to its proper use what is such an annoyance and so injurious to them.

Mr Spence proposes, then, to convert what is now a fatal nuisance (the contents of our chimneys and town drains) into a great benefit. We shall let him speak for himself: "I should propose, then, a system of atmospheric or gaseous sewage, and the complete removal of all these gases to a safe distance from our towns. The original suggestion of a mode for effecting this object is not mine, and I therefore disclaim all the credit that may attach to its author; but I am not aware of its having ever been given to the public in a practicable shape, and there are some views of the matter which may be safely presented as new. I would combine this gaseous sewage in such a form with our town-drainage as would bring all the liquid sewage in contact with the gases from our furnaces and our house fires, the liquid sewage being kept, as now generally proposed, separate from all surface drainage. The semi-liquid and fetid mass, being brought into contact with the sulphurous acid gas

(the result of our perfect combustion), would have its putrefactive process arrested, and the foul emanations neutralised; all its ammonia converted into sulphate, and thus permanently fixed, and all the sulphuretted hydrogen and other unwholesome gases decomposed. When concentrated in this innocuous form from various districts to a convenient place, it might with perfect safety be manufactured into manure more valuable than the richest guano, as I shall afterwards attempt to show. All the gases from our coal combustion would have to be conveyed along the same tunnels to centralising conduits, converging to a point where an immense chimney, at least 600 feet high (for Manchester), should be erected to discharge these gases into the atmosphere, the ascensive power being obtained either from the retained heat of these gases, which would probably be found quite sufficient, or if not, artificial heat could then be supplied to effect that object."

Mr Spence in the above quotation honourably disclaims all credit that may attach to the author of the plan he proposes. We believe that the idea of combining ventilation with sewage originated with Sir James Murray of Dublin, a gentleman well known in the scientific and medical world as the discoverer of fluid magnesia, and in the agricultural world as the discoverer of the superphosphates and several other important chemical salts, and of their value in agriculture. We shall let him detail the history and nature of his own plans in his own words.

While prosecuting his investigations into the salts of magnesia, and the simple, double, and triple phosphates, &c., from which have resulted so much ease to suffering infancy and distressed humanity, and such incalculable benefits to agriculturists, as we showed in a previous number of this Journal, Sir James Murray was led, from the well-known power of pure magnesia of preventing putrid odours, "to follow up the displacement of offensive and unhealthy vapours from low, close, damp cellars, vaults, or drains. This inquiry again led on to others, and at last proved that the odious gases fermenting in underground sewers must be consumed, or dissipated into the clouds." In a paper read before the Surgical Society, Dublin, on 30th Jan. 1858, he described the plan which he had put in practice for the consumption of the putrid odours and deleterious gases from sewers. "In a little work* printed during the cholera," said Sir J. Murray at that meeting, "and formerly laid before you, I strove to originate easy and simple means to utilise our street-lamps, and also the upright spouts of houses, so that instead of consuming pure atmospheric air, required by us, these conduits, connected with drains below and with flues in houses and the flame of lamps above, would draw up the foul air from under our feet, and leave the pure air above our heads to [illegible]

* [illegible] Longman and Co.

"The abatement of odious fumes and smells is a medical question of vast importance to houses, towns, and public institutions. You are all aware how difficult it is to grapple with such aerial nuisances on a large scale. We can decompose or clarify liquids, but aeriform bodies escape in all directions, and you cannot confine them in towns to be decomposed. On the contrary, our town authorities place grates along the streets, to let up odious, fermenting, and putrid gases for us to inhale by day and by night. The same municipal managers place lamps along our streets, which, being high, attract purer air, and burn it away outside our habitations, whilst we are inhaling the vile vapours which emanate from cellars, vaults, walls, rooms, and furniture, the entire day and night. We get the foul vapours from under our feet, whilst the burning lamps take the oxygen flowing over our heads.

"These vile emanations I conduct into the pillars of street-lamps, to be consumed by the lights, or into upright spouts of houses, which at the chimney-tops I connect by pipes with the flues of funnels, the lower ends being inserted air-tight into the crown or arch of sewers or channels below the ground. By this plan I reverse the present order of respiration—I give the lamps the foul filthy vapours from the deep drain under us, and I furnish animals with the unvitiated air that lamps hitherto consumed. Any gentleman who will call upon me, may see this theory put into practical operation near my house in Temple Street."

"My first experiments on the advantages of a partial vacuum for abstracting offensive vapours were carried out at my house, Merrion Square, Dublin, as set forth in the *London Medical and Surgical Journal*, 1831. To consume and disperse the baneful gases generated in the sewers, I perforated the top or arch of the drain, united it by a hose inserted into the lower end of the upright rain-spout, outside the house, and fixed a valve in it at the parapet of the eve, to open by rain, so as to let it down from the gutter. A pipe attached to the spout at its superior extremity entered the kitchen funnel above the roof. I found the heat of the fire there to rise nearly to that of boiling water. At this temperature the air rushing up the spout was so much rarified as to draw up the vapours of the great sewer, so as to dry the floors, to disperse the bad smells and gases into the clouds, and to cause rapid ventilation through the channels below the basement."

Sir J. Murray proposes a plan for disposing of the sewage different from any hitherto suggested. He shows how this can be done in towns having the advantage of a canal near them, and those which have not this advantage. According to his plan, the water from the streets must not be admitted into the sewage drains. He suggests to the municipal authorities of Dublin to try the experiment. "Let them," he says, "rest a tight canal-boat on the floor of a lock; let a stanch tarpaulin hose around hoops connect the

main sewer with the boat's hold to let the drainage rush in, whilst the air escapes by a pipe passing through a fire and funnel on deck or on shore. The close boat can take in 6 tons of slush in a few minutes. The chimney-flue being laid aside, and the conduit-hose coiled up, the lock is filled; the vessel rises, passes along the canal to the country, and discharges the cargo by the same hose down some bank-sluice into a filtering floor. Peat-mould, mixed with cheap refuse of magnesia, aluminous and acidulous dust, fixes the ammonia and double phosphates, and saves vast strata of dry guano, worth 80s. per ton on neighbouring farms, whilst the decanted liquid serves for valuable irrigation in the vales. In other places where sewage and surface-floods have a good fall, precipitants are placed in reservoirs or filtering-pits, through which the liquids ascend, and the clear water rises to the top over a platform of chemicals, so as to purify the rivers and canals themselves, and to prevent odious mud from subsiding in them." This latter plan is not original, having been proposed by Prince Albert several years ago. In places where the levels are not suitable for getting the sewage into the canal-boats, Sir J. Murray suggests that steam or other power should be employed for pumping it into the boats, while the chimneys of the engines would serve as ventilators to the drains, by drawing the noxious gases up. In this there is a manifest similarity between the plans proposed by Spence and Sir J. Murray. But the latter proposes, in addition, that hot muriatic acid gas should be injected into the drains, by the condensation of which in water, rarefaction would be produced, so that the smoke, vapours, and gases in the drains would be drawn rapidly through them; and at the same time the muriatic acid would combine with the ammonia, making the muriate of ammonia, and by forming other chlorates, the best of disinfectants would destroy the miasms in the sewerage drains, purifying the air in them, as it did that in the cathedral of Dijon when infested by malaria. He further proposes, that, a good current of air being produced in the drains by the rarefaction caused by the injection of the hot muriatic acid, the smoke from the factories might be introduced, the carbon and ammonia from which would be deposited (the latter combining with the muriatic acid), and thus a valuable compost would be formed.

Such are the schemes proposed by Sir J. Murray and Mr Spence, [illegible] giving an unvitiated atmosphere to the inhabitants of towns and a useful manure to the agriculturist. The object of both is the same—viz. the preventing the noxious vapours from the sewers [illegible] chimneys from mingling with the air which townspeople breathe, [illegible] the utilising of the products of combustion, and of the contents [illegible] sewers. The means proposed are similar—viz. the production [illegible] strong current of air or draught in the sewers by means [illegible] great part of the liquid is rapidly

evaporated, and the noxious gases are forced along till they are beyond the reach of doing any harm. The one proposes to effect this by means of one large chimney for a town such as Manchester, trusting to the neutralising power of the sulphurous acid and the antiputrescent property of the carbon, both of which are the products of combustion for purifying the air in the sewers; the other proposes the same effects to be produced by conducting the noxious gases up innumerable water-spouts and lamp-posts, to be carried far above the tops of houses, or consumed by the lights at night; and in addition to the carbon and sulphurous acid of the smoke, he proposes that hot muriatic acid should be forced into the sewers to neutralise the deleterious gases. According to this plan, the water-spouts of every house would be the purifiers of its own sewers.

This scheme for utilising the sewage of our towns certainly recommends itself to the favourable consideration of our municipal authorities, from the many advantages it possesses over any other proposed. First, it shows a ready way of both rendering useful some of the noxious vapours, and of rapidly carrying off, without annoyance or injury to any one, those of them that cannot be turned to profitable account. That this is quite practicable, is evident from what is stated by Sir J. Murray, when he describes the effect of the experiments in his own house to be "to dry the floors, to disperse the bad smells and gases into the clouds, and to cause rapid ventilation through the channels below the basement." Mr Spence also states his own experience in "having rendered quite sweet the air in a bedroom on the first floor of my house, which was before quite uninhabitable, by bringing a branch from the main sewer right under the kitchen-grate, from which a pipe of cast-iron, 4 inches diameter, was carried up through the brick-work behind the kitchen-fire, and the open top projected into the chimney a yard and a half above the fire!" These are facts worthy of the attention of farmers, for, in most cases, proper ventilation is very little understood or attended to either about their houses, or in their stables and byres. It is seldom that a case of fever takes place in a farmhouse but it can be traced to the deadly miasmas from the putrefying dunghills placed close to their houses. And many a byre has been emptied, many a valuable horse has been lost, from some fatal epidemic, the origin of which was attributed to the air, while its true cause was to be found in the bad ventilation of the houses, in the festering filth in them, or in some choked and neglected drain under them.

A second advantage that this plan of utilising the sewage possesses over every other proposed is, that, on account of the rapid passage or draught of hot air through the sewers, a considerable portion of the liquid is evaporated and carried off in the form of steam, while the remainder is mixed with the soot from the chimneys; and being thus formed into a kind of liquid sludge, is in a

more convenient state to be afterwards evaporated, if thought necessary, or carted away; and we thus get quit in some measure of that great obstacle to the utilisation of sewage—viz. the immense quantity of water in it.

A third advantage is, that, owing to the heat in the sewers, chemical decomposition and combination will be going on along their whole course. In fact, the same processes will be carried on in the sewers at no expense whatever, which it is proposed in other schemes should be done at no little cost in buildings erected for the purpose. It may be objected that the temperature will not be as high as we would suppose. The current of air through the sewers will be much the same as a hot blast, sweeping everything before it; for the only air admitted into them will be what has passed through the furnaces. Nor do these currents part soon with their heat: Sir J. Murray found that, in a chimney nearly 100 feet high, giving vent to a fire used for a small still, while the thermometer,

At 24 feet from top, was	90° Fahr.
„ 18 do. do. it rose	100° „
„ 12 do. do. do.	100° „
„ 6 do. do. do.	110° „
„ 2 do. do. do.	198° „

So also the temperature, being 55°, 24 feet from top, the thermometer rose

	In Parlour Chimney.	In Kitchen Chimney.
At 18 feet from top in ten minutes,	10°	25°
„ 12 do. do. do.,	20°	30°
„ 6 do. do. do.,	20°	50°
„ 2 do. do. do.,	30°	70°

A fourth advantage is that which concerns the agriculturist most—viz., the large quantity of valuable manure that will be obtained if this proposal were carried into execution; for not only would the whole of the substances which are obtained in the processes by precipitation be present in the manure, but also the whole of the soluble salts in the liquid, in a form better adapted for application to the land, and in addition, the ammonia and carbon from the smoke. We need not remark here upon the fertilising effects of soot; they are too well known to most of our readers to say anything in their favour; but it will give some idea of what we really get in this manure, if we mention the quantity of ammonia really obtained from the combustion of coal. A learned professor is reported, in the *Journal of the Society of Arts*, London, to have stated, that in the process of converting coal into coke, in coke ovens, ammonia was produced and wasted by being thrown into the atmosphere in the proportion of 6 tons of sulphate of ammonia for every 100 tons of coals operated on. Dr Angus Smith found from experiments that not more than 1½ ton of sulphate of ammonia was obtained from every 100 tons of coal,

or 35 lb. of sulphate for every ton of coal. Mr Spence assuming, however, that not more than 22.4 lb. of the sulphate are obtained from every ton of coal, calculates that 20,000 tons of sulphate of ammonia would be annually produced in Manchester were his plan adopted; and this, valued at £15 per ton, its average market price, would be worth £300,000. The manure obtained according to his plan would contain carbon, sulphates of the alkalies, phosphates and silicates, all which exist in the sewage, and are valuable to the farmer; and every ton of the manure would contain 4 cwt. of the sulphate of ammonia, which is equivalent to 5 per cent of pure ammonia. We conclude these remarks by wishing these plans proposed of utilising sewage every success. It is true, we see no immediate prospect of their being carried into execution, as they propose such a change in the arrangement of the sewage drains, and of the transmission of the smoke from the factories, as would entail considerable expense, which might deter municipal authorities from making a trial of them; but they are at least worthy of the attention of all concerned in the health of the people, and the prosperity of the agriculture of the country; and we can promise the magistrates of towns that if by this or any other plan they are enabled to utilise their sewage so as to produce a manure containing all that is valuable both in the liquid and in the solid refuse of the towns at a reasonable rate, the farmers will not be slow in relieving them of it.

RHENISH WINE AND RHINELAND.

Two years ago I spent some time very agreeably amongst the most celebrated vineyards of the Rhine, and last summer I repeated my visit to a few of them, for the purpose of comparing the vast difference which a full and a scanty crop of grapes presents to the astonished spectator. In 1855 the crop was almost a universal failure, owing to the late frosts in April destroying the fruit-bearing shoots of the vine, while in 1857 the vines were loaded with an exuberance of fully ripened fruit, such as has not been seen in the memory of the "oldest inhabitant;" and the consequence is, that the vintage of 1857 will stand out prominently as the largest and finest for many years past, or at any rate since 1811. In 1855, search had to be made amongst the luxuriant green leaves for a bunch of grapes, and, when found, the fruit proved diminutive and unripe. In 1857, on the other hand, bunch was suspended over and beside bunch in such profusion that surprise was excited that so small a plant as the pruned vine was able to bear so large a quantity of fruit as far to outweigh the weight of the plant itself, and which it could not have done without ample support. Everywhere the grape was presented to the tourist, in

inviting bunches of red and white, at the low cost of six kreutzers (2d.) the bunch. Every one was eager to cool his mouth in a burning day with so cheap and refreshing a beverage, for the copious juice of the ripe grape is really a beverage. Vineyard grapes in ordinary seasons are not so palatable as those of our own hothouses; but the last summer's heat afforded proof indisputable that the natural sun is not to be outdone by the artifice of man. I have eaten grapes on the banks of Lake Como, grown in the open air, of much finer fragrance than from any vinery in this kingdom.

In every respect the vine is a remarkable plant. No one could anticipate, on first seeing a vine-plant without leaves, that its dry, withered, wiry stem could produce elegantly-formed expansive leaves and beautiful bunches of fruit of large size and weight, suspended as they are from the most frail-looking tendrils; but, notwithstanding its shrivelled aspect, the vine is a plant exceedingly susceptible of external influences. Colour, size, form, taste, aroma, productiveness, vary in a remarkable degree with a change of soil, position, and temperature. It is, therefore, no matter of surprise that the grapes of the sunny side of Johannisberg should be very superior in flavour to those of the north-facing slopes on the opposite bank of the Rhine, or that stronger and hotter wines should be produced in warm regions than in such as are cold and temperate. The peculiar nature of the soil, its constituents, the influx and drainage of water, the lightness and stiffness of the ground in which the roots extend themselves, the dryness or dampness of the air in which the leaves expand themselves, the changes or equality of temperature, all exercise a marked influence on the vine and its fruit, and, in consequence, on the wine produced from it. Such influences even effect varieties in the species of the vine. Its varieties, in fact, are so endless, that Chaptal, when Minister of the Interior, caused 1400 different species out of France alone to be transplanted into the garden of the Luxembourg. Such varieties may not only be observed in different parts of the globe, but in the same country and on the same spot.

One piece of practice in the culture of the vine I witnessed last summer which there was no opportunity of seeing two years ago, and it was concealing the bunches of grapes from the direct rays of the sun behind screens formed of growing leaves, and at the same time leaving them open to light. This process is very dexterously and carefully managed. Its object is at once to sweeten and to render the grapes uniformly and simultaneously ripe. It would be a great inconvenience to the wine-maker to have a wide interval between the ripening of the different kinds of grapes, so that the practice of screening is founded upon sound principles. The direct rays of the sun when strong, as it was last summer, foster by their *heat* the acid principle of the grape by increasing the amount of tartaric acid which exists in all grapes; and it does so more decidedly in the red than the white grape, because the dark colour absorbs

the heat most readily; whilst the *light* of the sun, passing easily through the white skin, evolves the saccharine principle in the white grape in a greater degree than in the red, and thus brings each kind ripe nearer at the same time. Without such precaution the heat would ripen the red grapes a fortnight earlier than the white; but in every case the light renders the white sweeter than the red grape. Protection from the direct action of the sun also improves the flavour of the fruit, and were the bunches covered with oiled paper the scent of the fruit would be farther increased.

Fetid manures, such as fecal matters and the mud of great towns, exercise a very prejudicial influence on the odour of the wine; while, on the contrary, manures which are inodorous and putrefy slowly, such as wool, horn, and bone-black, conduce very much to enhance its fragrance. The putrefying organic substances of the manure pass in such large quantities into the plant that they are observable in the fruit. The leaves of the vine, which contain a considerable quantity of alkali, constitute an excellent manure for the plant. At the vintage, only the fruit is removed from the vineyard; and when the leaves fall to the ground, their constituents necessarily compose the best manure for future vine-leaves. Only in this manner can the fact be explained that the vine requires little inorganic manure, and often contents itself with substances which it obtains principally from the weather-beaten rocks on whose slopes it is planted. The quality of the soil may differ considerably without having a decided influence on the quality of the wine; but wines of dissimilar bouquet may be obtained from very different soils. Inorganic vine-manures are as important to the plant as the soil itself. Organic manures are also of consequence to the plant; if it is very nourishing, the larger quantity of wine will be produced, but the wine will not be so well scented nor so well tasted. The temperature of the region in which the wine grows has no less important influence upon it than the composition of the soil. When the summer is sufficiently long, and the temperature of the whole year does not sink below a certain minimum, the vine produces nothing but ripe and well-flavoured grapes; but when the vine yields exuberantly, the quantity of wine depends entirely on the temperature. A good vintage, in regard to quantity, does not necessarily produce excellence of wine, for the most productive years are frequently those which yield bad wine. The full ripening of the fruit by the action of the sun is of the greatest importance in order to secure good wine. On this account the vines are not allowed to grow high, but the nearer they are kept to the ground the better, in order that the heat of the sun may be reflected back upon them from the ground, and the process of ripening is then carried through the evenings and nights by the warmth which is radiated from the earth. The vines are not kept short to obtain a greater quantity of grape-juice, for those which are allowed to grow 6 feet

and upwards yield a larger quantity of juice, but their wine is worse than from the short vines in the same place. The kind of grape is one cause of the great variety of wines. Both the quality and quantity of the wine is affected by each individual variety of the vine. Temperature and soil together, determine, to a great extent, the kind of grape. To no other cause can the perpetuation of the innumerable varieties be ascribed. Transplantation into different districts has been attempted to improve the quality of the wine; but if the vine is removed from a warmer to a colder region, the saccharine contents diminish, and they increase if it is brought from a colder to a warmer district. There are vine districts where the different kinds of grape are not kept separate; but mixed varieties never yield the best wine. Those, therefore, who wish to make good wine, take care at the vintage to keep each kind of grape separate. As purple grapes generally ripen earlier than white ones, it is necessary, at the vintage, to pick them before the white, in order to avoid having sour bad wine. The excellence of the wine depends in no small degree on the ripening of the grapes, and the care with which they are gathered and treated. Those who know the care expended upon the better sorts of grapes, know also that the excellence of the wine depends not only on climate, soil, and kind of grape, but also on the fostering care bestowed by man upon the vine. A really well-flavoured wine can only be obtained from ripe grapes, and such as are free from admixture with unripe or over-ripe grapes. Great care is taken at the vintage to keep the decaying grapes from the ripe ones, and where this care is the most bestowed there will be the better wine. The possibility of the future wine being spoiled then dates from the vintage. The grapes for the better kinds of wine are not only picked from the bunches (*aus leze*), but they are picked over again afterwards. When grapes and stalks are pressed together, the fruit should be ripe enough for the stalks to look brown, for hard green stalks would spoil the wine. In order to obtain wine of uniform quality, the grapes are gathered in one day, to fill one or more vats of the same size with their juice. The strength and peculiarity of wines may be explained by the treatment which the grapes receive before being pressed. Grapes are in some places allowed to become dry in the vine, and a *dry* wine will then be produced. In other places grapes are dried by the sun upon straw, and in others they are dried by means of artificial heat, and these produce what are called *boiled* wines. Very various is the heat of autumn, during which the wine is made. An acquaintance with many details, of which the wine-maker is still ignorant, is necessary in order to investigate thoroughly the influence of temperature upon a good well-tasted [illegible] which should not spoil with age.

[illegible] a prevailing opinion that red wines are made from red grapes, [illegible] white wines from white grapes. This is an erroneous opinion in

the abstract, for grape-juice of both red and white grapes invariably afford white wines. The colouring matter is derived from the skin of the grape, and it can only be made available for colouring the wine through the instrumentality of fermentation. The red skin under fermentation imparts a red colour to wine, and the white skin imparts to it a yellow colour. The colour of wine is therefore one of the results of fermentation. Grape-juice soon ferments; when just expressed it is thick, and on exposure to the heat of the sun it quickly changes into a fermented liquor. The fermentation superinduces important changes in the composition of grape-juice; it produces alcohol and the acetic acid which did not exist in it before; and when the skins are added to the juice, and also subjected to fermentation, they produce colouring matter and tannic acid, the red skins affording a larger quantity of both. The more the red wines contain of colourless tannic acid, the darker they will be by holding more in solution of the colouring matter of the purple grapes. The colouring matter is a blue matter, and it assumes the red colour by union with the free acids of the wine, such as the tartaric.

The chemistry of the vine and of wine is highly interesting, and it has received much elucidation from the labours of the celebrated Mulder, who has lately published a memoir upon it.* The most marked chemical peculiarity of the vine is, that it contains a large proportion of potash. The ashes of the wood contain from 24 to 44 per cent; they contain also from 1.8 to 8.6 per cent of soda. The ashes of the entire fruit contain of sulphate of potash 5.0, chloride of potassium 2.7, and carbonated alkali 44.4 per cent. Lime also enters largely into the composition of the vine, being from 32.2 to 43.7 per cent in the ash of the wood, and phosphate and carbonate in the fruit. There is also from 7.4 to 19.6 per cent of phosphoric acid in the ash of the wood, and 23.5 of phosphate of lime in the fruit. Magnesia appears from 1 to 9 per cent, and iron from 0.2 to 0.7. Thus potash predominates, soda also exists, lime is found in large quantities, and phosphoric acid is not inconsiderable.

Crasso found the purple skins of grapes to yield 41.65 per cent of potash and 20.31 of lime; and the white skins 46.89 of potash, and 21.73 per cent of lime. He also found the stones of purple grapes to yield 27.89 per cent of potash and 32.18 of lime, while those of white grapes yielded of potash 29.45, and of lime 35.57. Thus the skins and stones of white grapes yield more potash and lime than those of purple. From Crasso's investigation we may conclude that soda, which constitutes a considerable proportion of the ashes of the wood, diminishes greatly in every part of the fruit,

* *The Chemistry of Wine.* By G. J. Mulder. Edited by H. Bruce Jones, M.D. F.R.S. London: John Churchill, 1857.

and is entirely awanting in the stones; whereas the potash plainly increases in quantity, though to a less degree in the skins than in the juice, so that two-thirds of the skins consist of potash. A great deal more potash accumulates in one kind of grape than in another. He found also in the unfermented grape-juice oxides of iron and manganese, which pass partially into the wine; also a large quantity of phosphoric acid, which belongs to the albuminous substances of the grape-juice, and a small proportion of common salt. In the juice of the unripe grape, and in the constituents of the ash, there was no marked difference, so that the fruit appears, during its latest period of development, to have an individual life, and to be comparatively independent of the plant. Potash thus predominates in all parts of the vine, in the leaves and fruit, as also in the stems and boughs; so that unless a sufficient quantity of potash exists in the soil, the vine will not flourish, and also all the components of the ash must exist in sufficient quantity in the ground to produce a well-developed plant.

With regard to the wine, certain of its peculiar properties in colour and taste are connected with the quantity of potash, soda, lime, and certain acids which exist in it in a larger and smaller proportion, which exert a very great influence on the quality of the wine. If, for example, a larger proportion of phosphoric acid and a smaller of lime than usual is contained in the grape-juice during its fermentation, a good deal of lime and magnesia will be thrown off. The sulphuric acid and chlorine will not be withdrawn, but will combine with potash and soda, with the potash which formed part of the cream-of-tartar in the grape-juice, and more tartaric acid will appear in the wine than in the grape-juice. The wine will acquire a harsh or sour taste, and if it be red wine the colour will be brighter. All this is merely the result of the grape juice containing more phosphoric acid. In like manner, a larger proportion of other constituents will cause other changes.

Boussingault found that the vine absorbed the following quantities of inorganic materials from 2½ acres (the hectare) of cultivated land:—

		Alkali.
Potash,	16.42	32.30
Soda,	0.15	
Lime,	12.49	
Magnesia,	3.24	
		Acid.
Phosphoric acid,	7.23	9.16
Sulphuric acid,	1.93	

He compared these results with the exhaustion of the ground occasioned by the following plants:—

	Alkali.	Phosphoric acid.
Potatoes,	63	14
Mangel-wurtzel,	90	12
Wheat with straw,	27	9

So that the assertion that the vine requires more alkali than other plants, on account of the grapes alone, is erroneous, nor can any probable reason be alleged for maintaining that the removal of the grape alone, while the constituents of the leaves are returned to the soil, exhausts the alkaline contents of the earth more than they are exhausted by the removal of other plants.

Among the constituents of the ash of grape-juice and of wine, almina is stated by many to exist. The first who indicated the existence of alumina was Baschof, who discovered it in Rhine and Moselle wines. Alumina was formerly believed to exist in many vegetables, but the supposition has been found to be erroneous, and it appears to be found really in very few plants. It would certainly be remarkable if it did really exist in the grape-juice. Winckler gave the explanation of the remarkable phenomenon. When he had the grape washed in pure water, and afterwards pressed, the alumina was to be found in the juice. Its origin, therefore, is not in the plant but in the dirt which sticks to the fruit, and, adhering to the juice during the process of pressing, is afterwards taken up by it. Alumina may therefore actually exist in the wine, but is not to be regarded as a constituent of the plant.

As regards the acids in wine, there is no doubt but that tartaric acid exists in grape-juice; and it has been established that malic acid is found in unripe, while tartaric acid is found in ripe grapes, and that no malic acid appears to exist in wine prepared from perfectly ripe grapes. Pasteur succeeded in turning tartaric acid into racemic acid, and considering how nearly related acids are to each other, and how possible it is to turn one acid into another, it can astonish no one that racemic acid should be more and more frequently met with in wine. The admixture of a small quantity of racemic acid would make no difference whatever in the quality of the wine, but a large quantity would. Wines which contain, besides, tartaric acid and a large quantity of racemic acid are sweeter, and of red wine darker coloured than wine which contains only tartaric acid. Free acids are found in all sweet wines, but almost in any case they are masked by sugar: flavour alone will not lead us to any just conclusion as to the amount of free acids in wine, since a much smaller quantity is often found in acid wines than in sweet ones, where the larger proportion of sugar conceals the free acids. As a rule, the presence of a considerable quantity of free acid in any kind of wine, with a proportionate amount of sugar, very materially improves the flavour of wine. According to Lüdersdorff, but very little difference exists between the French and Rhenish wines with respect to the total acid contents, while Frezenius considers that the best Rhenish wines generally agree with one another, and contain about a half per cent. It is a question whether any other free acids exist in wine besides tartaric, acetic, and tannic acids. From $\frac{1}{4}$ to $1\frac{3}{4}$ thousandth part of anhydrous acetic acid is contained in wine;

the smallest amount is found in Tavella, the largest in Madeira. From 2 to 7 parts perfectly free tartaric acid are found in 1000 parts of wine. Tavella has the largest, and Bordeaux Sauterne the smallest amount. It is particularly necessary to keep a distinction between acetic and tartaric acid, as the flavour of the wine very much depends on the preponderance of the one over the other. From the analyses that have been already made, we learn that a considerable quantity of acetic acid is contained in all wines, and that their harsh flavour is by no means entirely to be ascribed to tartaric acid.

Sugar exists in grape-juice, and it is called "grape-sugar," although the name no longer denotes a particular kind of sugar. From four parts sugar from grape-juice only three parts can be obtained solid, and one part as fruit-sugar; as much as forty per cent of solid particle, mostly sugar, may be contained in the juice of very ripe grapes, but the greater number contain much less. According to Schübler, the specific gravity of grape-sugar in the Neckar district was from 1.050 to 1.090; and according to Metzger, in the environs of Heidelberg from 1.039 to 1.091. These specific gravities, expressing the saccharine contents of the grape-juice, may be received as an approximation to the truth. From these may be deduced that the proportion of sugar obtained by Schübler in the Neckar district, was from 14 to 24 per cent, and by Metgzer in Heidelberg, from 14 to 22 per cent. The extreme products of sugar from grape-juice is from 13 to 30 per cent. However insignificant the amount of sugar may appear in some wines it is nevertheless of great importance in diminishing the sharp taste of the free acids, and in imparting an agreeable flavour to the wine. Unless red wines contain about half per cent of sugar, their flavour is not agreeable; in some the quantity is more considerable. Sweet wines, some of which are nearly one fourth of their weight of sugar, often contain not only a little uncrystallisable sugar, but fruit-sugar. The sugar which appears in wine has the distinctive characteristics of uncrystallisable sugar, as it is produced under the influence of fermentation. The grape-sugar of grapes passes first into fruit-sugar, and then into uncrystallisable sugar. According to Frezenius, the sugar in four kinds of Rhine wine amounts exactly to six-sevenths of the extract, which gives, in 7 parts residue, 6 parts sugar, and 1 part composed of all the salts and non-volatile substances. This is true of Rhenish wines, but in red [illegible]deaux very little sugar is found—not 1 per cent.

[illegible]minous substances exist in grape-juice. By the analysis of [illegible] of the Riesling grapes of Gruenbach, from 1 to [illegible] gluten was obtained. Thénard appears to have obtained [illegible] from the Johannisberg grapes. The existence of vege[illegible] is placed beyond doubt by following certain processes; [illegible] therefore proved that an albuminous body may not [illegible] form. [illegible] that the fermentation of grape-

juice must be caused by an albuminous body. We have learned that during fermentation the albuminous matter of the grape-juice and pulp are resolved into ferment, and are separated in the form of an insoluble body, of which, according to Braconnot, as much as 20.7 per cent may be found in the sediment of newly-made wine. We must not, however, infer from this, that no albuminous body in any form can be found in wine, but only conclude that but little of any kind of albumen exists in it. Liebig entirely denies the presence of albumen in wine; and yet the quantity in it is such that it can hardly escape the examiner, though in Madeira and Teneriffe it is certainly small. The presence of albumen in wine is important on two accounts: first, it gives one more means of detecting adulteration, when wines are analysed with this view; and secondly, its capability of spoiling wine, since all albuminous bodies undergo chemical change, and are capable of transferring this motion to such other bodies as may be brought into contact with it. Albumen affects change even in alcohol, and turns it into acetic acid, and this again into vegetable gluten and mould-plants. Wines containing little tannic acid and alcohol, such as the less excellent Rhenish wines, the small quantity of albumen contained in them continues to act upon the other ingredients so as to produce decomposition; and such wines will therefore not keep long. Such Rhenish wines as are able to defy time are richer in alcohol; and those sweet wines which contain a great deal of sugar, possess in that sugar an element which hinders the action of albumen. The results of numerous analyses show that from 1½ to 2½ parts albumen, and from 1½ to 3 parts ferment extract, exist in 1000 parts wine.

Grape-skins form an important consideration in the making of wine. These contain the tannic acid and the colouring matter of wine. Not the slightest trace of tannic acid is to be found in the juice of either kind of grape. The larger the quantity of skin, and the more they are pressed in preparing wine, the greater will be the tannic acid in the wine. The juice of white grapes, allowed to ferment without the skin, yields a wine almost entirely free from tannic acid. Wines prepared in this manner lose less of their colour by age than any other. White-grape juice, on the contrary, in which the skins are allowed to ferment, gives a liqueur wine which darkens with age. Raisins prepared from white grapes cease to be white, and become light brown, because the atmospheric action has changed the tannic acid contained in the skin into apothema, a brown substance. It is not by the process of drying that the skin of the raisins acquires a brown colour; for if they are softened in water they do not regain the natural hue, but remain brown. The dark colour of mahogany is derived from the apothema produced from the tannic acid contained in the wood. Precisely the same observation may be made with respect to our wild chestnuts, which are covered with a perfectly white skin, so long as the seed is pro-

tected by the husk, but when this bursts, becomes dark brown in the space of a few hours. Pure Rhine wine is generally considered to be excellent in proportion as it is yellow; and a perfect agreement is found to subsist between the colour of the wine and that which it assumes, in consequence of its larger contents of tannic acid, when salt of oxide of iron is added to it. In the change of colour undergone by red wine there are various phases, the last of which is when the tannic acid is slowly converted into apothema, whereby red colouring matter is precipitated out of the liquid: it thus gradually diminishes, and finally, after a length of time, disappears entirely from the wine, which then remains what is called yellow. The fact, that difference of time causes perceptible variety in the colour of red wines of the same kind, is thus explained by the various circumstances in which the colouring matter finds itself. We are acquainted with only one kind of colouring matter, and there is no reason for supposing that more than one kind exists, however great the variety of colours in wines may be; but although only one colouring matter is to be detected, variety of colour, almost without limit, may be found in red wine.

The colouring matter of the skins of grapes is blue, and the action of acids makes it red. In unripe grapes, which are saturated with acid, it is consequently red; and the riper they grow, the more the disconnection of the acid causes it to become blue. The less acid the grapes contain the darker are the skins, and consequently the wine extracted from the juice and the skin is darker also. The skins of very ripe grapes are often black. After an elaborate examination of the colouring matter of red wine, Mulder comes to the conclusion, that there is only one colouring matter, and it is of a blue colour, and that it remains unchanged in all wines; it suffers no alteration. It does not originate the sediment which forms in red wine, since it combines and is deposited with another substance, which gradually becomes insoluble. It has the same properties in old and young wine.

The stones of grapes are remarkable for containing a considerable quantity of tannic acid, and of a greenish-yellow coloured fatty oil, which is suited both for food and burning, but is disagreeable in taste and smell.

Grape-stalks, like the skin, and especially the stones, have a sharp astringent flavour, and they yield a considerable portion of tannic acid. Thus skins, stones, and stalks yield tannic acid, but not the juice itself.

Fat is also to be met with in grape-juice, although the actual quantity is insignificant. In the same way the quantity of fat acids existing in wine is not large; and without asserting that they are yielded entirely by the fat found in the juice and stems, it appears that the quantity of fat existing in these is more than sufficient to [illegible] the fat acids of wine. This point is of special importance, [illegible] acids play an important part in wines; and those wines

in which the skins and oleaginous stones have been allowed to ferment, contain more fatty oil than those obtained from grape-juice alone. Batilliat separated fat from must, in the form of a fatty oil, and ascribed it to the grape-stones. He considers the amount present to be too insignificant to affect the wine, but forgets that only one forty-thousandth of œnanthic ether is found in wine. The fat separated from the sulphide of lead, by means of ether, was found by Oudemans to amount to 6 parts in 100,000 parts of wine: not enough, certainly, remarks Mulder, for any one to grow fat upon.

Complicated as the composition of grape-juice is, it is rendered still more so by the process of fermentation, which adds new ingredients to the juice, besides inducing new combinations with existing substances. Wine cannot be made from grape-juice without fermentation; and it would be a very difficult matter indeed to prevent it, in the high temperature in which some countries are situated. It is here unnecessary to explain the phenomena of fermentation, which are very well known; its results are all that interest us at the present moment. The most remarkable product of fermentation is alcohol, and it is derived from the sugar existing in the grape-juice. We have already seen that the saccharine contents of grape-juice is from 13 to 30 per cent; and as 198 parts of sugar give 92 of alcohol, or about 2 to 1, the juice of the German grapes gives, when analysed, as a maximum, from 7 to 15 per cent of alcohol by weight. But some of the sugar remains undissolved, and during the fermentation more alcohol is evaporated than water. Therefore the alcoholic contents must be under 15 per cent as a maximum, and 7 per cent as a minimum, in German wines. The knowledge that 92 parts of alcohol in wine supposes 198 parts sugar in the grape-juice, enables us to arrive pretty accurately at the saccharine contents originally contained in the grape. For example, a port wine containing 16 per cent by weight of alcohol, if it has not been mixed with alcohol, must have been produced from grape-juice containing 34 per cent of grape-sugar. When the summer has been unfavourable, owing to want of heat and excess of rain, the grape often yields juice which contains less sugar; but the desire to obtain, notwithstanding, a serviceable wine, often leads to the introduction of foreign elements to doctor the juice. Cane or beetroot sugar, and, for cheapness, potato syrup, are added; but as long as the sugar is pure, it matters little what kind of sugar is used, as all yield alcohol, and chemistry cannot detect the difference. Aroma, however, cannot be obtained from grapes which have been badly ripened. Raisins have often been used for the inferior German wines. Addition of sugar to grape-juice is often employed to obtain a stronger wine from good grape-juice. Thus, as well as when the juice is sour, much depends on the necessary quantity of the matter necessary to fermentation, and it is of consequence that sour grape-juice should not contain too much tartaric acid; and when it does, it is counteracted by means of chalk,

which is added to a portion of freshly expressed juice, and its free acids are then withdrawn—that is, the free tartaric acid, and half the cream-of-tartar. Lime is used in the same way as chalk, but both are considered as means of adulteration, for pure wine professes to be grape-juice changed by fermentation alone. Experience has proved that atmospheric air is essential for the promotion of fermentation, but is less or even not necessary for its continuance. Liebig advocates the admission of air, the famed Bavarian beer being prepared when air enters freely. In 1846 an experiment was tried at Johannisberg by Prince Metternich, with six casks of wine, each containing 1200 bottles, in which an opening of six square inches was made, covered with a coarse piece of canvass; and it was successful. But both aroma and alcohol are lost when wine is fermented in open casks. Much, however, depends on the quantity of sugar in the grape-juice, and the kind of grape, for good wine has been obtained by exclusion as well as by admission of air. There is one thing certain, that the action of the oxygen of the air changes the alcohol into acetic acid, and this substance ought by all means to be avoided. Attention to temperature is necessary for the prevention of the formation of acetic acid. A high temperature during autumn promotes fermentation, and a low one is detrimental to it, and inequality of temperature during fermentation is extremely injurious, and not unfrequently spoils the wine. In consequence of the chemical action, and notwithstanding the escape of carbonic acid, the heat of the liquid exceeds that of the air. It has been known that fermentation is promoted by a copious supply of tartaric acid and grape-juice. Fermentation is more rapid in the juice of not very ripe grapes, which contains a considerable quantity of malic acid, than in that of perfectly ripe grapes; and wines containing a great deal of sugar, and therefore less free acids, ferment more slowly than those in which the proportion of sugar is smaller.

Boussingault ascertained the yield of alcohol from grapes on his property of Schmalzberg, near Lampertsloch, from the years 1833 to 1837; and the results were, that in 1834, when the average temperature was highest during the whole season, the largest quantity of alcohol was produced, and the reverse was the case in 1833 and 1837. The largest yield of alcohol in 1834, in hectolitres of 22 gallons per hectare of 2½ acres, was 5.05, whereas in 1837 the yield was only 1.55. The temperature at the end of summer appears particularly to affect the quality of the wine, and this opinion seems justified by the results of the famed vintage on the Rhine in 1811, as well as by those of probably the more famed vintage of 1857.

Wine undergoes great care in many processes after fermentation has ceased, in order to render it palatable and durable. The clearing of wine is one of those processes, and its object is to remove all the [illegible] matters which render wine turbid, and cause a constant [illegible] and indeed until they are got rid of, new

fermentation will ensue, and new chemical changes take place. Wine therefore, as long as it has the ingredients of ferment in it, cannot be durable, and new wines must be treated until they become clear as if they had been filtered. Red wine is clarified, in order to make it lighter coloured; and all wines are also clarified, to diminish the quantity of tannic acid in them, which gives a too harsh and astringent taste to them. Various ingredients are employed to clarify wine—such as albumen, isinglass, blood, milk, cream, common salt, lime. Lime is always capable of imparting to wine the same property which is given by albumen and isinglass, the wine being rendered less astringent by the precipitation of tannic acid, and it becomes at once less acid to the taste. From these two causes, lime has become much more general in the preparation of wine, and it also gives to wine an appearance of age. Lime, however, like the alkalies, if employed in excess, turns wine brown.

The object of sulphurising wine is to hinder fermentation, by combining with the albuminous substances present in wines, and thereby rendering them inert, and by attracting to itself the oxygen which is necessary to decomposition. The absorption of oxygen changes sulphurous into sulphuric acid, which also combines with albumen, and forms a compound which is incapable of fermentation. Too much sulphurising is easily perceived in the wine, and when the sulphur contains arsenic, the wine is thereby rendered arsenical. Sulphurising is particularly applied to sweet white wines, which, possessing an excess of sugar and albuminous matters, and but a small amount of tannic acid, are easily decomposed. The same process applied to red wine makes them lighter coloured. One great advantage gained from sulphurising the casks in which the wine is to be stored is, that it prevents the formation of mould, which invariably imparts a musty taste to the wine.

In regard to keeping wines in the cellar, it may be stated, as a general axiom, that those which have retained a considerable portion of albuminous matter, and possess but little tannic acid, and contain much sugar, cannot be kept long. This occurs in the case of the weaker sorts of Rhenish wine, which contain but little alcohol. Wines which can be cellared with success are those which improve by age. In these, odoriferous substances are found—they become less and less acid, and better tasted. Such as are coloured, deposit a considerable amount of sediment, and as long as kept in cask increase in strength of alcohol. Both leather and wood, and the substance of the bladder, are more easily penetrated by water than by alcohol; and hence wines kept in cask, or even in bottles covered with bladder instead of being corked, become stronger in alcohol, as has been proved by the experiments of Graham and St Vincent. As the water of the wine evaporates from the cask, the void is filled up with wine, otherwise the action of the air in the cask would turn the wine sour by converting the alcohol into

acetic acid; and as the water is replaced by wine, the contents of the cask improve by age, not only in strength but in flavour. The vinous components, being more concentrated, are better able to act chemically upon each other; and this alone would account for the improvement of the wines, because the tartaric acid is thereby increased, but not the cream of tartar, which is insoluble in alcohol, and is constantly precipitated. The larger the cask the smaller is the surface in proportion to the contents. Casks of 200 quarts contents evaporate one-twelfth of their bulk, whereas those of 4716 quarts only evaporate one-twentieth. The opinion that wine becomes richer of alcohol that has long been kept in bottle is erroneous, because evaporation is much hindered by the cork, even when not sealed with wax, and the sugar in red wine is too insignificant in quantity to evolve alcohol by means of fermentation, and in old wine the opening of the cork causes no escape of carbonic acid. Therefore the formation of alcohol in bottle is impossible.

One of the unfavourable results of cellaring wine is the use of wooden casks. Wine put into oaken casks increases in tannic acid, which already exists in it in a greater or less degree. But albumen is also present in oaken casks; and as soon as the watery ingredients of the wine have absorbed the tannic acid, it will unite with the albuminous matter, and adhere to the wood. The oak wood of different countries affects wine differently. The oak wood from Danzig and Stettin did not much affect the colour of the white wines of La Gironde; whereas the same white wines were much coloured by the oak wood from Memel, Liebau, and Riga, and their taste rendered astringent by the dissolution of tannic acid. American oak wood had little effect upon those white wines, imparting only a somewhat bitter taste. The Bosnian oak, from the shores of the Adriatic, affected the white wines so strongly as to render them black in the air, by imparting a large proportion of tannic acid. French oak wood is less injurious, though containing a good deal of tannic acid. In considering the action of oak wood upon wine, a distinction should be made between coloured and non-coloured wines. All light-coloured wines suffer greater or less alteration. A distinction should also be made between old and new casks. Old casks have lost those substances which they could impart to wine; but, on the other hand, wines which spoil easily, on account of containing too much albuminous matter, may be materially improved by remaining for some time in new open casks, for the tannic acid of the cask renders the superfluous albuminous matter of the wine inert. Old casks may, however, injure wine, by decomposing such tartar as is deposited, or even by rendering the tartar acid. Casks are, therefore, prepared by various means for the reception of wine.

Many wines which have been long in bottle acquire a flavour which is ascribed to the cork. This is as great a mistake as to attribute the flavour of wines which have been long cellared to the cask.

The cause in both cases is the same. The moist cork, one side of which is in contact with the air, allows, equally with the wood of the wine cask, the development of mould plants. The mould grows from the outside to the inside, and imparts a taste to the wine which we call musty or corked. The smell of mould may be perceived in every large cellar of wine. In case of mouldiness, casks are cleaned outside and inside, and wine in bottle recorked.

The effect of both heat and cold has been tried upon wine. Warmth produces a diminution of the quantity of free acids in wine, which are either decomposed or combine with new non-acid substances. Warmth increases the appearance of age in wine rapidly. It has been recommended to place bottles corked, but not quite filled with wine, for two hours in warm water, at a temperature of 185° Fahr., and afterwards to allow the wine to cool, and fill the bottles. Wine containing much alcohol acquires thus the flavour and aroma of that which has been cellared for ten or a dozen of years. Both Lamotte and Boussingault made experiments on the effects of cold upon Burgundy. Lamotte observed that the wine became turbid before the point at which ice melts was reached, and he found it deposited tartar, colouring matter, and a nitrogenous substance. Wine begins to solidify partially at about 20° Fahr., and the effect is, that freezing renders weaker wines almost equal to the better sorts in their alcoholic contents; but the amount of alcohol does not either principally or entirely determine the properties which render the flavour of wine agreeable.

Wine is subject to disease, which is understood to be a condition in which the wine has become so altered and unfit for use as to have lost its distinctive character. The turning of wine is one disease, which shows itself, under certain conditions of the weather, either suddenly or in a very short time, and is peculiar to young wine. The colour of the wine becomes darker, and its taste insipid. If the disease increases, the colour becomes brown, the wine turbid and of a disagreeable taste, and may at length disseminate fetid gases, and leave an acid liquid. This disease is caused by a decomposition of tartar. White ones, of good quality, are not subject to this disease, but only red. Ropiness is another disease of wine, which renders it thick and sweet. It consists in the formation of vegetable mucus from the sugar of the wine, water being at the same time separated. The wines which are subject to this disease are those deficient in tannic acid, and sweet wines are more particularly liable to it. Ginger-beer is subject to the disease of ropiness, which is identical with that of wine; and so is London porter. Wine is also subject to the disease of bitterness, which is the result as if a second fermentation had taken place, inasmuch as a large quantity of carbonic acid is evolved. The bitterness is ascribed either to critic acid or to the tartrate of oxide of amyl, which are both very bitter. This disease often disappears of itself, and old Burgundy has been cured of it by

mixing it with younger wine. Acidity is also a disease of wine, which depends upon the conversion of alcohol into acetic acid, and is therefore an actual oxidation. Weak wines are apt to turn acid if allowed to come in contact with air at a high temperature, which, in fact, is just the process for making vinegar. Mouldiness is a disease in which mould-plants are produced on the surface of wine in casks. Being principally a cellulose, its formation is not known. It is certain that the admission of air is favourable to this disease, and alcohol disappears during its progress. Whatever be the disease of wine, the cause is always to be found in the substances contained in the wine. An albuminous substance is found in all wines, and by it wine is improved, and which improvement it develops out of other bodies, odoriferous and well-flavoured substances. Albuminous bodies, however, are the causes of movement in the organic kingdom—active in the origin as in the decay of bodies, in the living plant as in its products. They have no repose till they are annihilated; and other substances, either to their advantage or disadvantage, are dragged into annihilation with them.

Wines may be classified according to their constituents. There are—(1.) Sweet or liqueur wines, some of which have no excess of sugar, as Madeira; others are enriched with sugar, and others again are prepared from dried grapes, or by evaporating a portion of must by means of artificial heat, such as Malaga, Tokay. (2.) Acrid or harsh wines; they are rich in tartaric acid, but poor in sugar—such as the Rhine and Moselle wines. (3.) Spirituous wines, such as Portuguese and Burgundy. (4.) Wines containing tannic acid, to which most of the French wines belong: except as they contain less alcohol, they resemble the spirituous wines. (5.) Effervescing wines, such as Champagne, sparkling Moselle, and Hock. Liqueur wines are characterised by excess of sugar. By drying the grapes, or evaporating part of the must by heat, sweet wines may be prepared from all kinds of grapes, and a richness in alcoholic or saccharine contents may be imparted to them which they did not derive from the grapes. For the making of sweet wines, grape-juice would require to contain 50 per cent sugar, which it does not. Harsh wines have most bouquet, on the supposition that they are not absolutely poor in alcohol and sugar. Spirituous wines, more especially heavy-loaded red wines, are apt to undergo, in the course of time, a considerable change in colour and flavour. Such as contain tannic acid are also considerably affected by time, and lose their flavour. Effervescing wines generally remain good only for a short time, since they are saturated with carbonic acid condensed in the wine. Most of the properties of wine depend upon the sugar, alcohol, tartaric acid, and water, which exist together in it, putting aside taste and smell as standards of comparison. The preservation of the wine is in a great measure to be ascribed to tannic acid; for the albuminous matters, which are always combined with tannic acid in wine,

are thus prevented from decomposition, and the principal cause of the wine spoiling is thereby checked. Wines, therefore, which are intended for exportation, or to be long cellared, must not be deprived of too much tannic acid by means of albumen or gelatine.

Œnanthin, a gum, is described by Fauré as a substance which is found in the best French wines. To this he ascribes the substance and body of the wine, a property which is highly valued in good Medoc wines. Fauré did not find this substance in different wines; it was found in small quantities in moderately good wines, but in the best wines it always appeared, though in very variable quantities. It exercises a very great influence upon the flavour of the wine; aromatic wines, in which it is wanting, are on that account less palatable, which is proved by the fact that their flavour is greatly improved by the addition of œnanthin.

Aromatic wines contain, according to Winckler, not only acids, and compounds of ethyl with acids, but also a substance of an alkaline nature, to which he principally ascribes their aroma; and this alkali, Mulder considers, is nothing but ammonia.

If wine be evaporated to dryness, a certain amount of solid substance is always left, which invariably acquires a darker colour, if dried at a temperature of 230° Fahr. All such ingredients as are volatile, as ether, volatile oil, besides alcohol and water, then disappear; whilst the sugar, gum, albuminous matter, extractive matter, the non-volatile free acids, the salts of organic and inorganic acids, are left. The flavour of wine is without doubt very much affected by the residue left after evaporation, which contain fixed and free acids and other ingredients, which, taken together, have not much taste, but probably have some effect on the taste of the wine, whilst the influence of the colouring matter of red wine, and of the apothema of tannic acid, is less decided. On the other hand, tannic acid, especially in red wines, has a decided influence on the taste of the wine. The sweetest wines leave the largest residue after evaporation: it amounts sometimes to one-fourth of their weight. In good cellared Rhine wines it may rise from 2 to 10 per cent. All the non-volatile constituents of wine, taken collectively, naturally promote the excellence of wine.

To ascertain the substances which give the peculiar vinous smell to wines is a difficult problem for chemistry to solve. The so-called fusel oils are those which have shed most light upon this subject, they being ethereal oils—a mixture of several liquids, in which the solid substances called fatty acids are dissolved. This mixture may be obtained either by distilling large quantities of wine, as in brandy distilleries, or by subjecting the grape-skins which have already fermented with the juice to distillation. Those who adulterate wine are tempted to improve the less aromatic wines by addition of some odoriferous substance. Mulder divides this difficult subject into three considerations; first, those substances which are proper

to all wines; secondly, those which are developed in wine after length of time; and, thirdly, such as depend entirely on the pecu liarities of the places in which the grapes are grown. In regard t the first class of substances he says, it may appear singular, but nevertheless true, that the ethereal ingredient which imparts t grape-juice after fermentation the vinous odour, alcohol excepted, i itself fetid, and no one can find it agreeable. It may be distin guished by its smell alone. It is œnanthic ether, which diffuses smell of fusel long after the disappearance of alcohol. That sme which is peculiar to all wines must to a great extent be ascribed t œnanthic ether. It is clear, however, that a volatile body appea together with œnanthic ether in wine, and imparts to it a sme differing from that of œnanthic ether. The volatile substance whic thus imparts odour to wine, beside the œnanthic ether, is alcohol Œnanthic ether exists in all wines, and imparts to them such a dis tinctive character, that if only a few drops of wine are left in bottle it will retain the vinous smell for days and weeks—not, how ever, having the agreeable odour of bouquet, but something lik wine which has been exposed to evaporation, being in fact a feti ethereal liquid. But of the second class of odoriferous substance developed in wine in the course of time, their name is legion. The do not exist in every wine, but one or several are found combine with œnanthic ether in aromatic wines. They are compounds o oxide of ethyl, amyl, or propylene, with acetic, propionic, pelargoni butryc, capriocic, caprylic, hippuric, benzoic acid, &c. I cannot fo low the varied actions of these substances with their compound Under the third head are those ethereal oils which exist in abun dance in the vegetable kingdom, and appear in all parts of vegetable and even in fruits. We perceive in the juice of single grapes—mu cadels, for instance—aroma combined with agreeable flavour. It therefore no wonder that wine prepared from such grapes shoul retain the aroma of the juice. This bouquet is therefore not th effect of fermentation, nor the product of a substance first origi ated during fermentation, for it existed previously in the juice. A a rule, they are seldom found in the grapes of our colder district and fragrant oils are mostly met with in grapes of warmer district They abound in our flowers and in fruits; pine-apples and renne and peaches are well provided with them. The amount, however, o volatile oil existing in grapes and imparting aroma to wine is s insignificant, that it will probably be a long time before we a thoroughly informed concerning them. What kind of ethereal oi are employed to increase the bouquet of different wines? Portion of fragrant plants are mixed with must in order to extract the ethereal oil. Different plants are resorted to for different wine and we have rose-leaves, lime and elder flowers, the leaves o meadow-sweet, the peel of quince pears, the blossom of wild vine leaves of sage, and perhaps the ferment oil of the centaury. The

and others are commonly added to improve the aroma of wine. Probably the odoriferous ingredients actually exist in the juice of some of the grapes. In order to give the bouquet of good Bordeaux to less agreeable wines, it has become customary to put violet-roots and the roots of the Florentine iris into them. They contain an agreeably-scented stearopten, according to Dumas. Bley has separated a fragrant ethereal oil by distillation from raspberries, and most aromatic grapes scarcely possess a hundredth part of the aroma of the raspberries. Let no one imagine that, since fresh wine is not fragrant, it cannot therefore contain odoriferous substances, and that all odoriferous substances must necessarily be the products of fermentation. It has been already remarked that the juice of many grapes is fragrant before fermentation, but that the young wine contains excess of œnanthic ether, which makes it offensive, and apparently causes young wine to affect the head, and less of it can be borne, and a free indulgence in it produces uncomfortable feelings. This fetid œnanthic ether masks at first the fragrance of aromatic ingredients. It is not till the wine has been some time in store, and other fragrant ethers have been engendered from œnanthic ether, that the original aroma of the grape-juice reappears, being no longer masked, but having its bouquet increased by other aromatic ingredients. These are sometimes found in the fusel oils of younger wines, sometimes in those of bad wines. They are found at an early period, though in no very large quantities, but they cannot impart aroma to wine until the greatest portion of the œnanthic ether is decomposed. Œnanthic ether is generally supposed to occasion the vinous odour; but the truth is, it spoils the bouquet, and although it gives rise to many of the aromatic ingredients of cellared wine, so long as it predominates in the wine it is by no means fragrant. A thorough knowledge of chemistry, says Mulder, is not sufficient to explain everything which concerns the aroma of wine. It is well known in pharmacy and perfumery that fresh-distilled waters have not a pleasant, but rather a disagreeable smell, particularly if they are prepared from fresh plants. They obtain the fragrance which characterises them after the lapse of time. We need not here look for the formation of a new substance, but rather for the decomposition of one, or for a combination yielding a less agreeable odour, so that the original odour disappears at once. Competent judges are well able to distinguish between the scent of a distilled water—as peppermint-water, for example—from dissolving peppermint-oil in water. Chemistry here finds its boundary: in both cases it finds peppermint oil and water, and nothing more; at least it cannot with certainty determine the cause of the difference. The same holds good with respect to the delicate aroma of wines, differing widely from each other. Brandy, which, according to Schubert, is added to port-wine in the proportion of one-twelfth, may at first be indicated by its smell. This port-wine

is allowed to lie three years before it is produced, and by that time the smell of brandy has vanished. This is true of substances naturally existing in wine, which also require time to accommodate themselves to the other bodies present there. Among the series of fusel oils, nothing is known of the substances which appear in rum and other distillates of fermented liquids. Rum is the product of fermented sugar-cane syrup, arrack of rice-flour resolved into sugar, and moutwyn of wheat-flour converted into sugar. Rum and arrack have a peculiar smell and taste, which depend as much upon fusel oil as those of cognac and moutwyn, although under other circumstances. Cherry-water is a proof how dependent the distillate of a spirituous liquid is upon its origin. Payen observes rightly that all kinds of starch, such as potato-flour, sago, arrowroot, the flour of different kinds of corn, &c., have a distinctive fragrance, which they owe to a volatile substance peculiar to each. According to Faber, the bouquet of wine is much improved by ethereal oil, which is found in the vine-blossoms, and best imparted to wine by collecting the blossoms which fall when shaken, drying them carefully, and putting a little packet filled with them into the must; or by distilling the blossoms with alcohol, and adding a little of the distillate to the wine. This method was recommended by Linnæus, on the ground that the flavour of a Smyrnian wine had been much improved by it. The Greek wines, according to Faber, generally have ethereal oil of vine-blossoms added to improve their bouquet. In speaking of the odoriferous ingredients of wine and their origin, ferment oils must be mentioned, although neither their properties nor origin are accurately known. They teach us, however, to direct our attention to something besides fatty or other acids in combination with oxide of ethyl, or suchlike substances. The production of volatile aromatic substances by the fermentation of plants is universal, and the grape-skins are perhaps as well suited to produce it as the constituents of the grape-juice itself. But no satisfactory examination has been made with respect to grapes. At any rate, these ferment oils deserve to be compared with the fusel oils.

I shall not touch on Mulder's instructions on the analysis of wine, nor on his method of distinguishing wines by chemical reagents, as these involve too much of pure chemistry for the general reader; but the adulteration of wines is a subject which excites the curiosity of every one. If pure wine is the product of the grape-juice after fermentation, it is evident that any addition or alteration of that pure liquid must partake of the character of an adulteration; and yet the processes of sulphurising, clearing, and cellaring wines are considered legitimate objects in the treatment of wine; and these processes must afford abundant opportunities for adulteration, if such be the desire of the wine-maker or of the wine-speculator. Chemistry is in a position to detect a great many of these adulterations; but Mulder's assertion that it is able to detect every

adulteration, is a complete mistake. It is bad enough, as he observes, that in proportion as science advances, and is more able to detect adulterations, means are discovered of multiplying such adulterations. "I place myself," he exclaims, "unconditionally on the side of those who consider everything added to or taken from fermented grape-juice (even the clearing it with albumen or isinglass, or the addition of substances containing tannic acid in order to supply a deficiency of that acid) as adulteration. But as it is not generally so understood," he adds, "I have no right, much as I regret it, to put this interpretation upon the term." Many honest drinkers of Portuguese and Spanish wines would wish that this great chemist had the control of directing the proper treatment of those wines after they had passed into the hands of the purchasers from those of the growers, when he thus so firmly expresses his sentiments against the abominable practices of adulteration. His ideas as to adulteration may be learned from the following formulæ which he enunciates:—When aroma is added in order to give the appearance of age to young wine; when cane or fruit sugar is added to sweeten it; when means are used either to withdraw a portion of tartaric acid from the wine, or to neutralise free acetic acid; when alumina or sulphuric acid is added, which generally is accompanied by the simultaneous addition of sugar, in order to improve the flavour of wines; when inferior wines are mixed with others; when water is added to strong wines; when alcohol is added to weak wines; in general, the addition of any substance with a view to obtain some property peculiar to good wine; the counterfeiting wine by preparing it by means of wine-ferment or other ingredients obtained from wine, or, indeed, out of other substances that are independent of grapes; the forcing carbonic acid gas into sweet wines to imitate effervescing champagne; hese appear innocent adulterations to many which are practised upon the taste of the wine-drinker, and of this character may be considered the blending of different kinds of wine, and the mixing of alcohol with wine. Neither the chemist nor the best prover of wines can do anything against the practice of blending, and as to the mixture of alcohol, it is at first perceptible to the taste, and may be thus detected, but after a time it combines so with the ingredients of the wine as to elude detection by the taste, or by the most minute analysis. I have thus drawn largely from Mulder's interesting memoir on wine, and mostly in his own words, and which are expressed in such modest terms as great minds alone study to acquire.

The agriculture of the Rhineland has improved amazingly since I first became acquainted with it in 1847. The soil of the great tract of land lying between the Tanaus Mountains and the Rhine is a clay loam, resting on sand and gravel. The clay is at parts many feet deep, at others not above half a foot in thickness. Where it is thin, drainage is required, and the herbage inferior; where it is

deep, the open bottom seems to afford a natural drainage. A few years ago the land was generally in a very foul state with weeds, now it is much cleaner, and now also the manure is applied in large quantities. The manure is all from the farmyard, the stock being constantly kept in the homestead. The crops are mostly of rye and oats, the rye affording the ordinary food to the population, and the oats to both man and beast. Wheat is now raised in increasing quantities, and so is barley. Red clover is cultivated with success as a forage plant. The peculiar crops are mangel-wurtzel, kohl-rabi, scarlet clover, and Indian-corn, all of which grow luxuriantly. Potatoes are largely cultivated, and ruta baga may frequently be seen. But the most striking feature in the change of Rhineland agriculture is the great extension of the cultivation of fruit-trees. These are not planted in masses like our orchards, but along the highways, and at stated distances in rows in the cultivated land. A farmer of this country would consider his crops to be ruined, were fruit-trees planted in his arable land; not so, however, the Rhineland farmer, for he in fact thereby reaps a double crop, one from the surface soil, another from the subsoil. The fruit-trees, instead of robbing the soil of its manure, or injuring the crops by their shade, derive their nourishment from the subsoil, where alone their roots exist; whilst the shade afforded by the foliage of the trees protects the crops growing on the surface of the ground from the scorching rays of the sun in summer. Both these beneficial effects I ascribe to the influence of climate, to the warm nights as well as to the warm days, which, in fact, afford to vegetation a double day in every twenty-four hours. We cannot follow such a course of farming in this country, because our nights are cool, however warm may be the days of summer, thereby keeping vegetation in check during the night, however it may be promoted during the day, and because our crops require all the heat and light of day, and no shading in the best season we ever have. This double culture affords the Rhineland farmer a double advantage; the ploughing of the land between the trees supplies their roots with air, whilst the fruit added to the ordinary crops of the soil, yield together such an increase as almost to insure remuneration to him whenever either the fruit or the grain crop succeeds. The ordinary fruits cultivated are apples and pears, both for eating, though the old apple-trees had been planted for the purpose of making cider. Cherry-trees are common, and so are walnut, but the increasing culture in fruit is in plums, and of these the Mirabelle seems the favourite. This is a small somewhat oblong yellow-coloured plum, sweet to the taste, and capable of being eaten ripe, or preserved for compôtes. The trees are pruned so as to allow the ploughing under the lowest trenches. A new orchard of Mirabelle plums, consisting of five thousand trees, has lately been planted in the neighbourhood of Kronthal; and on surveying the country from the heights, it is fast being covered over

with fruit-trees, which, in addition to the forests which are raised for fuel, will ere long give it a wooded aspect. The implements are yet rude; but the plough, though of the Kentish mould—a large wheel in front, with a gallows to support the beam—must have a good form of mould-board, since every part of it is kept clear by the action of the ground, a property which many of our own ploughs do not possess. I was pleased to see a turnip-drill, evidently of English manufacture, at work sowing swedes amongst the young plum-trees near Kronthal, to which I have already alluded. The rudest, however, are the hand implements; and were many of ours introduced into the hands of the Rhineland peasantry, they would make good use of them, for more industrious and painstaking people cannot be found in any country. The industry of the women is untiring, working from early morning to late evening in the fields. The fruit of their industry is the earning of money, which is evident in their external clothing and domestic comforts, which have both greatly increased since 1847.

THE PHYSICAL CONDITION OF THE PEOPLE: THE ARMY.*

"I AM afraid we all of us keep too much aloof from those beneath us, whom we thus encourage to look upon us with suspicion and dislike. Even to our servants, we think, perhaps, we fulfil our duty when we perform our contract with them—when we pay them their wages, and treat them with the civility consistent with our habits and feelings; when we curb our temper, and use no violent expressions towards them. But how painful is the thought, that there are men and women growing up around us, ministering to our comforts and necessities, continually inmates of our dwellings, with whose affections and nature we are as much unacquainted as if they were inhabitants of another sphere! This feeling, arising from that kind of reserve peculiar to the English character" (and we think even more characteristic of the Scottish temperament), "does, I think, greatly tend to prevent that mingling of class with class, that reciprocation of kind words and gentle affections, of gracious admonitions and kind inquiries, which more than any book-education tend to the culture of the heart, the refinement and elevation of the character of those to whom they are addressed. If I were to be asked, What is the *great want* of English society—to mingle class with class? I should reply, Want of sympathy."

* Report of the Commissioners appointed to inquire into the Regulations affecting the Sanitary Condition of the Army, the Organisation of Military Hospitals, and the Treatment of the Sick and Wounded; with Evidence and Appendix. Presented to both Houses of Parliament by command of Her Majesty. London: 1858.

Let us be thankful that these dying words of a wise and good man, Judge Talfourd, have not been uttered in vain. They made an impression on the public mind, owing to the painfully solemn circumstance, that the kind heart which prompted them ceased to beat immediately after they were uttered. They have been frequently referred to as a pleasing evidence of the better state of feeling in regard to social questions, and that in the school of national suffering we have learned at last how intimate are the bonds which unite all classes of the community, and that to be unmindful of these is to bring upon ourselves not only national guilt, but national calamities, so many and grievous as to recall Napoleon's bitter self-reproach—"it was worse than a crime—it was a blunder!" And yet there are certain phases of modern civilisation so very flattering and deceptive, that we are apt to gaze upon them with a self-complacent satisfaction, which indisposes us to probe deeply the unsound parts of the body politic, and to be prompt and vigorous in our efforts for their removal. We hear it constantly said in all tones, from stolid amazement up to intelligent wonder, "What a people are we! and what an age of progress is this!" Well, we have not a little to be proud of—"that's a fact," as our Transatlantic cousins pithily give utterance to their proud consciousness of what is undeniable in regard alike to them and us. And as this postulate is so readily granted among us, we need not do homage to Britannia, our tutelary divinity, and burn our handful of incense upon her altar. We are quite content in reasonable measure to admire the extent of our empire, the vastness of our wealth, the energy of our people, the irrepressible spring and elasticity with which the national vigour surmounts temporary depressions and disasters. We are very glad to have seen tubular bridges, a monster ship, and crystal palaces, and are not at all disposed to join that very numerous body, the croakers, who, since the days of Adam, have gone on asserting that every day the world is getting worse, until at last matters have come to such a pass, that our next step in the wrong direction must land us in perdition! We have too much faith in Providence, and in the predicted amelioration of the human race, to permit us to lie down despairingly in the slough of despond. And when we listen to the old story about our inferiority to "the world's primeval sires," and the rapidly accelerating tendency of all things modern to go to wreck, we are not only sceptical as to the alleged fact, but well pleased to think such scepticism orthodox: for has not Solomon given the *croakers* a merited rebuke? "Say not thou, What is the cause that the former days were better than these? for thou dost not inquire wisely concerning this." * We never listen to the one-sided views of such people, without remembering the witty saying of a wise

* Ecclesiastes, vii. 10.

German, "A half truth is generally more dangerous than a whole lie." Fichte surely was nearer the truth when pronouncing that, in the history of humanity, our era is "the state of completed sinfulness, midway between unconscious wrong-doing and conscious national right-doing." But while very far from desponding as to the future of the human family, and especially of that branch of it to which we belong, we are not deluded by the magniloquent talk which would persuade us that the time has come when science and industry are so omnipotent, that we rightly apply to them what Pliny said of Nature, "*De eâ nil incredibile existimari.*" It is no doubt astounding to reflect upon what they have effected, and upon the rapidity with which they introduce new forms of social life; so that if a modern Epimenides should fall asleep among us, and awake at the end of half a century, he would hardly know where he was, and in bewilderment would ask some one to explain those substitutes for gas and steam, and a host of other marvels of *his* day which had been superseded by new and beneficent discoveries and inventions. Still we have not been transported back to the peaceful prosperity of the golden age; and a very determined optimist must he be, who shall maintain that the millennium is at hand, and that of Britain, of Queen Victoria's day, it shall be said—

> "In *her* days every man shall eat in safety,
> Under his own vine, what he plants; and sing
> The merry songs of peace to all his neighbours:
> God shall be truly known; and those about her,
> From her shall read the perfect ways of honour,
> And by those claim their greatness, not by blood." *

If we choose to fall asleep in such a fool's paradise, we are sure to have a wakening some day, which shall shake our souls with terror, and fill us with bitter self-reproach. We cannot say that we had no premonition of righteous retribution in store for our misdeeds—our sins of omission and of commission. Parliamentary documents informed us so recently as 1848, that the total number of paupers (including casual poor) in the United Kingdom was 3,561,382, the expenditure on whom was the enormous sum of £7,941,778; the proportion of paupers to the population being, in England 11.8, in Ireland 17.8, in Scotland 8.6 per cent, respectively. In 1849, the number of offenders in the United Kingdom was officially announced as 74,162. The numbers of those significantly termed as "the dangerous classes" are known only approximately, but they must be alarmingly great; and when we reflect that among these are found desperadoes of every dye—thieves, robbers, "jail-birds" of every age, and miserable prostitutes, "troops of harlot women," as Milton terms Solomon's strange

* *King Henry VIII.*

wives—we cannot but confess that well bestowed is their ill-omened name.

And besides all this, the condition of the mass of our people is such as ought effectually to rouse us from those dreamy reveries of present strength and future stability in which some seem disposed to indulge, when hearing of "the progress of the age." Who, knowing anything about us, does not know that a few years ago the Registrar-General published the humiliating fact, that 33 per cent of the men, and 49 per cent of the women of England, at the marriageable age, were unable to write, or wrote so badly that they were ashamed to make the attempt? Who is ignorant of the frightful details concerning *the physical condition of the people*, which abound in sanitary reports? If any man be disposed to boast above measure of the power and the resources of Great Britain, and of the general wellbeing of our population, let him study these reports; or, more adventurous still, let him enter upon a course of reading in the Blue-book department of English literature, and we are confident that he will think of us more soberly, and as he ought to think. What a damper to national vanity are the quarterly reports of the Registrar-General! They are constantly assuming new importance as faithful exponents of our national weaknesses; and as they are not only severe, but sometimes very witty commentaries upon our follies, sins, and sufferings, the interest which they excite, and the remedies to which they prompt, lead us to augur well as to our national future. We are not so unduly sensitive as the people of the United States are, in regard to the publication of unpleasant truths. We have a sort of craving for "Commissions of Inquiry" into all sorts of things, and as to the doings of all sorts of persons. And the facts which these elicit are not entombed in the bulky volumes in which they are recorded. Newspapers, magazines, and journals expiscate them, seize upon their salient points, and turn them round and round, so that the popular eye can comprehend their bearings, and the popular mind convert them to the purposes of practical utility. We conceive that *this* Journal, devoted to matters more or less bearing on rural economy, is fulfilling its mission when directing its readers to the consideration of the physical condition of the people. Great as in modern times is the townward movement of our population, half of it is still domiciled in the country; and as that half supplies the void occasioned by the excess of mortality in the towns, it is evident that the deteriorated condition of the urban population closely concerns those inhabiting rural districts, and is consequently the subject of legitimate discussion in an agricultural journal. We therefore propose to make our readers acquainted with the results of the most recent investigation of the important subject indicated by the title of this article. But as the field of inquiry is so comprehensive as to embrace all classes, we must limit our re-

marks for the present, and make them to have special reference to the army. And the propriety of discussing such a matter in this Journal is apparent, if we reflect on what our army is made of. From an official statement of the occupations of recruits passed in 1855-6, it appears that 27,989 were husbandmen, labourers, and servants; 20,079 followed mechanical trades; 4223 were shopmen and clerks; 79 were students of law, medicine, or divinity; and 2161 were boys. If in one year nearly 28,000 recruits were supplied to the army from the rural districts, we can form some idea of how much the country contributes to this branch of the national defences. In fact, the soldier may be said to be drawn from two classes—the agricultural labourer, and the working men in towns—and is generally recruited at the age of nineteen. When country gentlemen are thus made acquainted with the perhaps unsuspected amount of vigour supplied to the army by the sons of their small tenants, and the labourers attached to their estates, they may be naturally expected to be curious to know how it fares with their quondam neighbours, when transmogrified into British soldiers. With the help of the bulky Report of the Royal Commission appointed to inquire into the condition of the army, we purpose to gratify this curiosity. The subject is of much interest and importance, even if regarded solely in a military point of view, but is of general concernment in its bearings on vital statistics, ignorance of which has inflicted, and is inflicting, upon us, sufferings and losses more to be dreaded than the combined hostility of all our enemies. How startling, how humiliating, to read such a statement as this in the quarterly report of the Registrar-General for England, dated 1st February 1858:—"England is a great country, and has done great deeds. It has encountered in succession, and sometimes in combination, all the great powers of Europe; has founded vast colonies in America, and has conquered an empire in Asia. Yet greater victories have to be achieved at home. Within the shores of these islands the twenty-eight millions of people dwell who have not only supplied her armies and set her fleets in motion, but have manufactured innumerable products, and are employed in the investigation of scientific truths, and the erection of works of inestimable value to the human race. These people do not live out half their days; *a hundred and forty thousand of them* die every year unnatural deaths; *two hundred and eighty thousand* are constantly suffering from actual diseases, which do not prevail in healthy places; their strength is impaired in a thousand ways; their affections and intellects are disturbed, deranged, and diminished, by the same agencies. Who will deliver the nation from these terrible enemies? Who will confer on the inhabitants of the United Kingdom the blessing of health and long life? Who will give scope to the improvement of the English race, so that all its fine qualities may be developed to their full

extent under favourable circumstances? His conquests would be wrought neither by wrong nor human slaughter, but by the application of the powers of nature to the improvement of mankind."

In the oldest book in the world we have read and believed that "all that a man hath will he give for his life,"* but the perusal of such a statement as the Registrar-General not only makes, but substantiates, tempts us to imagine that there are among us many converts to the horrid philosophy which justifies suicide under the debasing plea, that "the life of man is of no greater importance than an oyster." And yet it is not so. Life is sweet.

"Whatever crazy sorrow saith,
No life that breathes with human breath
Has ever truly longed for death.
'Tis life whereof our nerves are scant;
Oh life, not death, for which we pant—
More life, and fuller, that we want."

And this being the normal law of healthy human beings, we are constrained to attribute their apparent aberrations from it not to design, but to ignorance on the part of the many who know not, and to careless indifference on the part of the few who do know, what is required for the prolonged enjoyment of that greatest of human blessings, a vigorous youth followed by a hale old age, which gradually succumbs to the appointed doom, "once to die." Moreover, the study of sanitary questions is, in certain points of view, not only uninviting, but actually repulsive. It has been truly said, that the story of human degradation, misery, caused by ignorance of the simple laws of nature, has been told by many able men, and that it is scattered fragmentally through all literature, from the laws of Moses to the last daily paper. But about a century ago research and conviction seem to have coexisted. Light, air, and water, were recognised as necessary to health; but the sanitary reformers of that period could not induce governing bodies to continue precautionary measures beyond the existence of some dire emergency.† The continuous study of vital statistics, and the practical application of the knowledge thence derived, is among us a new thing—attention to which, until of late, was little likely to lead to fame or fortune, so that it has been neglected even by the medical profession. Hence, in answer to the question, "Writing statistics forms no part of medical education?" Colonel Sir A. M. Tulloch, K.C.B. (we are glad to give all his honours to our old schoolfellow), replies, "I presume not, when I had to take it up." As an encouragement to others to go and do likewise, we give the additional remark: "When I was engaged upon them, I, for a year or two, got nothing; but I saw it was a matter of very

* Job, ii. 4.
† *Remarks on Sanitary Arrangements for Armies.* By ROBERT RAWLINSON, C.E., one of the Sanitary Commissioners to the Army in the Crimea.

great importance, and I hoped that beneficial results to the army, *and even to myself*, would be derived, and *I have not been disappointed.*"

We are not, therefore, so much surprised as the public appears to have been by Blue-book revelations as to the sanitary state of the army. They are mere repetitions of what was going on around us all, dealing disease and death, whose origin was hardly suspected, and whose murderous influences even now we can with difficulty be roused to resist. When the light of modern research was allowed to penetrate into barracks, camps, and military hospitals, the usual result might have been confidently anticipated. The wearing of a scarlet coat has no prophylactic virtue, bidding defiance to the usual destroyers of human life and comfort. The soldier, instead of being exempt from the multiform diseases arising from exposure to heat and cold, from errors in diet, from excess of rest and motion, from want of cleanliness, from malarious influences in different climates and localities, from the vile atmosphere of foul sleeping-places, and of putrid hospitals—suffers from them to an extent which might well be deemed incredible. But incredulity is no longer possible—the veil is removed; the deficiencies of our military system have been detailed by those who have seen and suffered from them; the witnesses being of all ranks, from the humble private up to Miss Nightingale, whose evidence is so minute, so well considered, and so clearly expressed, as to demonstrate alike the vigour of her intellect and the tenderness of her womanly heart.

It is satisfactory to know that a remedy was found for the frightful deficiencies in the Crimean hospitals, and in the huts and tents of the troops round Sebastopol. And it is very important that we should note the simple means employed. The great panacea was fresh air—"*aer pabulum vitæ.*" The impervious felt covering of the huts caused much mischief: ridge-ventilation cured it. Before leaving England, the Sanitary Commissioners ordered, in anticipation, 10,000 square feet of perforated zinc plates for ventilation purposes; more was subsequently despatched; several miles of earthenware sewer and drain pipes were laid down; general cleanliness was enforced;—and so the plague was stayed. Nature got fair-play; and men began to have even more than the usual probabilities of living. The object of "Sanitarists," as health-students are now called, is to bring all men into at least approximate harmony with the requirements of our physical constitution. That object was at last effected among our Crimean soldiery in an unusual degree; and the result should be to convince the people of this country of the power which they possess over their own life and comfort, even in circumstances the most unfavourable. "It is no light increase of our responsibilities, as citizens of the State and members of the human family, to have it brought before our eyes

that those evils which some might be inclined to look upon as dispensations of Providence (as doubtless, in a certain sense, they are)—as misfortunes to be submitted to patiently, endured rather than combated—are really as much the work of our own hands—the result of errors either in omission or commission—as war, or anarchy, or social tumult, or destitution arising from indolence and improvident habits. Henceforth it is a law of our social existence that we shall see ourselves, individually and collectively, as being to ourselves the cause of at least a large proportion of those physical sufferings on which most of us have been accustomed to look as a necessary, though lamentable, condition of humanity." *

With a population of about twenty-eight millions, we have to stand in a constant attitude of watchfulness against the known ill-will, and possible hostility, of several Continental powers maintaining numerous armies. With demands upon our troops from various parts of Asia, such as war with Persia and China, and insurrection in India; from Africa, such as a Caffre war; from the Western World, such as a rebellion in Canada, and dread of a rupture with the United States—a stranger to our political system would infallibly infer that we maintained a numerous standing army, whose thorough efficiency was the object of our most anxious solicitude. The fact is, our army is comparatively small, though abundantly expensive; the desire of our people to serve in it is far from general; the difficulty of recruiting it by voluntary enlistment is constantly increasing, owing to the superior attractions of civil life. As to the care bestowed upon a means of national power and independence thus raised and supported, we have been hitherto willing to believe that the organisation and maintenance of our army were in harmony at least with the more obvious laws of physical wellbeing, as well as with the requirements of modern military science. We have had a rude wakening from this complacent dream. "John Bull" has read a Blue-book anent the home army, and very sulky is "John." His eyes are wide open, and there is an expression in them of something more than blank amazement. He is wickedly angry with a great many—how many, he does not exactly know—but in especial with those who call him a shabby fellow, careless as to the comfort of our gallant soldiers. Has he not, within a few years, granted to her most gracious Majesty some four millions sterling for barracks alone to her Majesty's troops? And now to read in a Blue-book that all this money, and millions unthought of besides, have only led to *this* result. "It seems almost incredible that it should be necessary to have recourse to the most unhealthy occupations in order to constitute any comparison in which the rates of mortality shall approximate to those prevailing among your Majesty's troops; for at present the

* Lord Stanley's Address on Public Health.

army stands almost at the head of unhealthy occupations in the United Kingdom." "John" is in a most Jonah-like frame of mind, and ready to prove to all the world that he "does well to be angry."

Having read, marked, and inwardly digested the said Blue-book, we are entirely of his opinion. But as "anger rests in the bosom of fools," we are confident that "John's" wrath is already largely mingled with commiseration for brave men senselessly slaughtered by invisible foes, and that the facts detailed in the said book will stir him up to determined exertions on behalf of the army, cost what it may, and however great may be the damage to "red tape" and "routine." We have no wish to rouse popular wrath against the army authorities, as if they had a smaller modicum of brains, and of bowels of compassion, than is common among their compatriots. But we must say the *vis inertiæ* is very strong, not only among military men of rank, but down to the humble private: the soldier is very apt to be drilled into quiet endurance of what, to a civilian, seems intolerable, or remarkably foolish. For example, sundry serjeants stand up for the leather stock—"choker"—because it makes a man look "smart," though, when in active service, he, as a matter of course, throws it away. As to Generals, bound hand and foot by routine, here is a choice specimen: James Mouatt, Esq., C.B., being asked, "Did you ever know an instance of an hospital in Ireland without any lavatory for the men?" responded thus—"When the regiment in which I served arrived in Clonmel, there were no means of ablution for the men of that regiment—the 9th, eight hundred in strength—except two pumps in the open air." (It was winter, observe you, gentle reader, accustomed to hot water, slippers, and dressing-gown.) "I pointed out (continues the merciful Mouatt, then, doubtless, nobody—now Esq., C.B.), that there were two or three unoccupied sheds, which, at a very trifling cost, could have been converted into ablution-rooms. The commanding officer agreed with me, and forwarded my letter to the major-general commanding the district," whose reply was to this effect—The lieutenant-colonel commanding the 9th Regiment was directed to inform the surgeon that the major-general was extremely surprised to learn that the men of that regiment were unable to put up with the same means of ablution which had served every other regiment stationed there before them. And so—observes Mr Mouatt, now "staff-surgeon of the first class, and local deputy-inspector of hospitals, on half-pay," and therefore, we opine, at liberty to speak out—"I believe that the men in that barrack are pumping *upon themselves* to this day." The more the pity, think we; their labours are certainly misdirected. The major-general commanding the district should certainly be made personally familiar with the virtues of pump-water bristling with ice.

Now, when men and major-generals are so conservative as to stick to bend-leather stocks and open-air ablutions by means of pumps, at the extravagant rate of two to eight hundred soldiers, it is high time that we, the public, who pay for all the apoplexies and consumptions induced by the said stocks and pumps, should interpose, and insist on the application to the army of the Act against cruelty to animals. How reasonably, we shall proceed to demonstrate.

We have quoted that portion of the Report which conveys to her Majesty the astounding information that a parallel to the unhealthiness of her gallant soldiers can only be found in the most unhealthy of the occupations of the British people. But terrible as is the consequent mortality, the jeopardy to military life is not fully shown by comparing it with the death-rate of the nation at large. That rate is sensibly augmented, because every year a certain per-centage of our military force is invalided and pensioned on account of disease contracted in the service; and of men so discharged, a large proportion "die during the first year." "The average number invalided during ten years preceding the war was 4000 per annum; last year the number was 8943."* The apparent health of the army is thus maintained by the constant influx of fresh lives in place of those weeded out by the invaliding process, and because of their deterioration thrown back into the ranks of civil life. Moreover, the soldier's is a picked life. He is not admitted into the army until he has been subjected to medical scrutiny, the carefulness of which is demonstrated by the fact, that during one decennium 335 per 1000 of those examined were rejected, some for reasons purely military, but one-fourth of them, at least, for causes tending to shorten life.† Inspection of the tables relating to these points brings out in a singular way certain national peculiarities of the English, Scotch, and Irish would-be soldier. The ratio rejected per 1000 examined stands thus—England and Wales 345.2, Scotland 401.3, Ireland 273.8. "The land o' cakes" does not thus look like a land of promise to those in search of exemption from bodily defects disqualifying for the army. But then our teeth are so very superior! The rejections for loss or decay of teeth are—England and Wales 18, Scotland 8.7, Ireland 6.7. If Pat can defy Sawney as to dentistry, and challenge him to show his teeth, Sawney's stronger mind enables him to bear it with composure; for while weak intellect causes the rejection of .7 per 1000 English recruits, and of .9 Scotch, the ratio for Ireland is 1.8. But there is possibly an explanation of this—very complimentary to Irish sagacity. The risk to life and health of service in the army is so well known in Ireland, that only fools think of enlisting! The statement as to the teeth of those aspiring to military fame strikes us as singular corrobora-

* *Report*, p. 55.

† *Appendix to Report*, p. 493.

tion of a remark made to us about a year ago by a lady recently returned from India—"Since I left England, everybody seems to have something wrong with his teeth."

But not to dwell on these curious *minutiæ*, we revert to the important fact deducible from the ratio of recruits rejected. The Commander-in-Chief of Her Majesty's forces seeks for and obtains the healthiest portion of her Majesty's subjects. He has put into his hands a human being labouring under no known bodily defect. "What will he do with him?"

Let this horrid Blue-book tell.

He kills him outright with amazing celerity, or throws him back upon civil society a miserable wreck of his former self, "sans eyes, sans teeth, sans everything" which drew on him the blandishments of the recruiting serjeant.

Here is the proof of this startling averment. The deaths in the general English male population, at the army ages, during the 15 years from 1839 to 1853, calculated at the annual rate of 9.2 per 1000, would have been 16,211; whereas the deaths in the British army, at home and abroad, were 58,139, being an excess of deaths among soldiers of no less than 41,928.

Of course, soldiers serving in foreign climates run risks not shared in by civilians at home. In order, then, that we may fairly estimate the comparative mortality of military and civil life, we are furnished with "Rates of mortality per 1000 men of the army at *home*, and of the English civil male population, at corresponding quinquennial periods, as stated by the Registrar-General."

Ages, 20 to 25,	Civilians,	8.4
	Soldiers,	17.0
25 to 30,	Civilians,	9.2
	Soldiers,	18.3
30 to 35,	Civilians,	10.2
	Soldiers,	18.4
35 to 40,	Civilians,	11.6
	Soldiers,	19.3

That is to say, if *the army at home were as healthy as the population from which it is drawn, soldiers would die at one-half the rate at which they die now.*

In our youthful days, when Blue-books had not enlightened our simplicity, we have sung a jolly stave, the *refrain* of which was,

> "His laurels are green when his locks are grey;
> Heigh ho! for the life of a soldier."

We know better now! A grey-headed soldier is a phenomenon twice as rare as a grey-headed civilian! The strangeness of such a statement is augmented when we further read—"Deaths per 1000 per annum, at ages between 20 and 40—Agricultural labourers, 6.055; labourers in rural districts, 8.002; printers, 9.090; police, 8.922; miners, 10.314; household cavalry, 11.1; Dragoon

Guards and dragoons, 13.5; infantry of the Line, 17.8; Foot Gua 20.4." Which, being interpreted, means, that a man may do m things which his hand findeth to do on this busy earth of ours— may be a ploughman, a night-printer, or a night-policeman— yet only incur about from a half to a third the risk to life incur by a soldier of the Line. Nay, if, in these days of competition a morsel of bread, he be driven off the face of the earth down i its bowels, the proverbial dangers of the mine are one-half l than he would incur were he doing duty with "the Guards," th splendid-looking fellows, whose bearing is so soldierly, and wh *physique* is apparently so much superior to that of a slouchi miner.

How shall we account for such an excessive mortality "amo 60,000 men, in time of profound peace, in a country which is n only the healthiest, but which possesses the greatest facility of co munication, and the greatest abundance of supply in Europe Such was the problem which at first perplexed the Army Commi sioners, but whose solution has now, we think, been found in t course of their thorough sifting of the various matters submitt to their investigation.

As might have been anticipated, there is considerable diversi among the witnesses examined as to the causes of this enormo mortality; and we have sundry amusing instances of extensive co clusions inferred from slender or doubtful premises. "Night du does it all," some were much disposed to argue, till a reference the superior health of the night-police shut their mouths. A bett case was made out by others, who dwelt much on want of exerci and suitable employment; and, odd as it may seem, it is really t fact that the foot-soldier suffers mortally from *ennui!* The gener impression used to be, that "men about town" and "fine ladie were the sufferers *par excellence* from this enervating soul-an body-killing malady. Well, so they are; but, saving their ge tility, it is well that they should know that this is a very vulg affection, quite common in the rank and file of her Majesty infantry. *Infantry*, observe you, courteous readers, for a man w has to take care of an animal so noble as a cavalry charger, i caring for *its* health, necessarily does a good deal for his *own*. H feeds, grooms, and airs his four-footed friend, with whom he h often a great deal of social intercourse, alike beneficial to mind a body. But your infantry-man has very often a distressing resen blance to a horse in a mill. He goes through a routine of milita duty, with which he soon becomes so familiar as to perform mechanically. For a certain number of hours a-day his ment powers are stimulated to the same degree of "attention;" the sam bodily organs are day by day called upon to perform movemen precisely identical, and which, besides being irksome to a soldi loaded with his accoutrements, are sometimes rendered still le

attractive by extra drill being ordered as a punishment for carelessness arising from tedium. Pedagogues fall into the same blunder when prescribing "a task" to a poor child whose nerves are worn out by sitting for hours in school, and whose brain is therefore no longer able to meditate fixedly on alphabetic mysteries.

When the soldier, disgusted with drill, is left, during the greater part of every day, to devise employment and recreation for himself, he is generally greatly at a loss how to dispose of his time, and on what or whom to bestow his tediousness. He is very apt to lounge about his drill-quarters, doing marvellously little which can be reckoned good either for mind or body. His female associates are notoriously "frail" specimens of the gentler sex. The stuff which he manages to get in the shape of strong drink is so infamous as to come alarmingly near the kind of potation described by Robert Hall as "liquid fire and distilled damnation." When the effects of excitement so produced have passed away, Private Tomkins is quite as apt to be "in the blues" as if he had been a sharer in those pleasures which make your "man about town" such a pitiful spectacle of nothing-to-doism. We therefore credit Colonel Lindsay's account of the miserable *ennui* of "soldiering," and heartily approve of his racket-and-ball-court suggestion, as a means of giving the soldier amusement. We know the happy consequences resulting from soldiers and officers engaging in games of agility, for we had the honour to be initiated in the laws of cricket by a troop of Hussars; and having also often witnessed the batting powers of Mr Bernal Osborne, we are inclined to trace back some of his hardest hits in "the House," to the corporal vigour acquired on the noble cricket-ground attached to a certain Scottish county town.

Employment for the soldier is, we are persuaded, essential to his vigour of mind and body; and therefore we hope the military authorities will not be oblivious of Sir Alexander Tulloch's remark: "I have always been anxious to see the soldier do more for himself—in fact, to labour at fortifications, *or anything that is wanted*, as I think that might tend to improve his health." The summer before last there was, in the south of England, a great lack of reapers at harvest-time. We remember that application was made to the military authorities to permit soldiers to assist in securing the crops; and though not absolutely certain, we have a vivid impression that the request was refused, on account of the anticipated injury to discipline. It must often be very vexatious to the farmer to see his crops in jeopardy, and to know that only military etiquette hinders their being secured by the help of the soldiers in his neighbourhood, one half of whom probably have learned to wield the sickle and the scythe. We do not see how fortification-work, which makes the soldier a labourer for the time being, should be less relaxing to discipline than harvest-work,

which for a few weeks restores him to those rural employments with which, in many instances, he was familiar previous to enlistment. And as he is dying for want of something to do, we hope yet to see it admiringly chronicled in the county journal, that Farmer Bull's crop of splendid wheat was reaped in a single day by her Majesty's —— Regiment of Foot, the officers goodnaturedly cheering on the men to the performance of their useful task!

The monotony of the soldier's daily home-life would thus be agreeably broken in upon, and he would, it is to be hoped, also enjoy a little variety of diet, the lack of which, it is surmised, is one of the causes of his unheard-of mortality. "With respect to cooking of food in British barracks, there is one kind of ration at all times and under all circumstances, for time and the seasons bring no change. There is one form of cooking—namely, boiling. It is boiled meat, meat new, boiled meat old, boiled meat tender, boiled meat tough; and the British soldier, after his twenty-one years' servitude, may 'thank God' (and the Government) 'for boiled meat enough.'" These are the words of Mr Rawlinson, C.E., late one of the Sanitary Commissioners to the Army in the Crimea; and from examination of the evidence in the Army Report, we are satisfied that they are founded on fact. Lord Ellenborough denied, the other day, that soldiers had only boiled meat daily, and with apparent reason. But his Lordship did not inform the House of Peers that when there is among soldiers a variety of food and cooking, this is the result of private arrangement among the men, who in their quarters are *not* furnished with adequate means of preparing something more appetising than the everlasting boiled ration-meat, which Sir A. Tulloch describes as "something between a stew and boil." Great need of Soyer, truly!

Among the causes of military mortality, some are disposed to give a prominent place to drunkenness. But remembering that a private soldier cannot have at his daily disposal more than about fourpence, and that if he hoards these up so as to be able to buy liquor enough to make himself drunk, he is subjected to punishment, we really do not see how he can drink beyond the average tippling rate of the tippling classes. Hence we cannot ascribe his excessive mortality to his excessive use of intoxicating liquors. One military witness differs from us, we observe, and adheres to his opinion, though an attempt is made to pose him by suggesting that the soldier's red coat makes his inebriety more conspicuous than that of the more soberly clad civil drunkard. But Sir Alexander Tulloch, whose acquaintance with soldiers and pensioners is so extensive, does not think military drunkenness much in excess of that which is too common among the lower orders.

All the witnesses ascribe much of the mortality among soldiers to the debasing sensuality to which they are so much tempted. We have not, however, observed that due prominence is given to the

abnormal condition of the soldier in respect to matrimony. He is a bachelor by compulsion, marriage being permitted in the army only in a very limited degree; and several commanding officers would add to this limitation. Now it is well known that the average duration of the life of the married very considerably exceeds that of the unmarried, so that here is an important fact in elucidation of military mortality.

But while Bacchus and Venus play no inconsiderable havoc amongst our soldiers, it is disgusting beyond expression to learn that they fall victims chiefly to the foul goddess Cloacina. Many of our barracks and hospitals are badly ventilated, ill provided with the means of preserving the comforts and decencies of civilisation, and are situated near the excrementitious deposits of large towns. Sir John Richardson, C.B., M.D., &c., gives the following shocking account of the Marines' barracks at Gosport. Having written to a friend, soliciting information about a fever prevailing there, he received this reply: "The disease is a pure typhoid, showing, after death, the ulcerated patches on the ilium and colon. It first appeared at Fort Cumberland, and the cause assigned was the overflowing of privies, and offensive exhalations from the moat."*

In this year of grace, 1858, it is humiliating to learn that such foul causes are mainly those which prove so murderous to British soldiers both at home and abroad. "Progress of science," forsooth! where should we look for it if not among the administrators of our military matters? And yet this Blue-book, on which we are commenting, is rife with revelations of filthiness, which stink in the nostrils of the whole nation, and cause a general turning-up of the nose at the mere mention of army administration. "'Tis wondrous pitiful," no doubt; but "pity 'tis 'tis true." But as filth is apt to be permitted to lie unheeded until it becomes offensive, we must beseech our readers to arm themselves with smelling-bottles while we horrify them with a solitary specimen of barrack life. We select as witness Sergeant Sotheron, 85th Regiment.

"Are the beds very closely packed in the barrack-room?—Yes; I have seen them only six inches apart. What accommodation is there in the shape of urinals?—The urine-tubs are brought into the barrack-room, and if a married person is living there, the tub is left outside of the room-door; and it is altogether most disagreeable. Is there no separation from the married people in the barrack-room?—None whatever; they have sometimes curtains, and in some regiments the commanding officer will not allow them to keep the curtains up except during the night, in order to have a circulation of air in the room."

We have omitted sundry details in order that we may disgust

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* *Transactions of National Association for Promotion of Social Science*, 1857.

our readers as little as possible; but so much we think it a duty to quote, in justification of the unmitigable disgust with which we regard military contempt for life, health, and decency. This frightful violation of all sanitary laws is confessedly the grand source of the mortality which ravages the British army. The medical officers, it seems, are not to blame. We find it again and again declared that their remonstrances are unheeded; and after the affair of the pumps at Clonmel we can easily believe it. But what are we to think of the education of officers who can permit the continuance of such murderous filthiness? They evidently require enlightenment on "common things"—such as the utility of fresh air and pure water.

Sir Alexander Tulloch, being asked, "Do you see any remedies for these causes of disease?" makes a suggestion so new as to startle the Commissioners, but evidently worthy of trial. "If I were going to build barracks, I should build them as detached houses, to contain only ten men, and thus put the troops in nearly the same condition as the agricultural population, from which they are taken." This would be an imitation of the hutting system, which was found to answer well in the Crimea, even under manifold incidental defects, which of course would be obviated were the system applied to the housing of our troops at home. The cost of a hut for ten men is estimated at £400 by Sir A. Tulloch, who strenuously advocates detached houses for soldiers, from pecuniary as well as sanitary considerations; although, like a sensible man, observing that if there be anything deficient in the medical establishment, it is impossible to put a money value on it. We observe that the Duke of Cambridge, in a recent speech, defended himself against the charge of indifference to the health of the army, by arguing that his representations were often put aside on the score of economy, and by asserting that the recent demand for reading-rooms and other accommodations for the soldiers had been complied with in many instances at the sacrifice of space requisite for health and decency. His Royal Highness may rest assured that the British nation has the liveliest interest in the physical, moral, and intellectual condition of the British soldier, and that this interest has been diffused as well as deepened by the events of the recent war. The complaint among reasonable people is not that too much is spent on the soldier, but that he is so little benefited by the profuse expenditure to which the nation has submitted, under the belief that we were thereby provided with a really efficient army, as healthy, intelligent, and moral as might be reasonably looked for. We now are informed, on undeniable authority, that the preventible mortality among soldiers is excessive—as great as that of the most unhealthy civil occupations; that the most ordinary [illegible]ges of civilised life are unknown in many hospitals and barracks; that the *souls* and bodies of paupers and criminals are far more

dulously and successfully cared for than are those of her Ma-
sty's forces. Colonel Jebb, while attesting "the readiness of the
ldier to profit by it," declares that he has been always "greatly
ruck with the deficiency of the spiritual instruction afforded to
ie army," and this all the more from being "aware of the great
ire taken by the Legislature, and all connected with prisons, to
ford to all criminals ample instruction in moral and religious
ities."

We have arrived, we conceive, at the climax now. This Army
eport proclaims to all men that the physical comfort and the
lucational and religious advantages of degraded felons are greater
an those provided for the brave men who have done so much to
nsolidate and extend the empire of Britain. A strange nation,
uly, are we. Who can wonder that to foreigners our national
aracter appears an inexplicable mystery—a strange compound
logical shrewdness and practical silliness—of generous benefi-
nce and cruel neglect? These Blue-book revelations, the more
ey are known—and we have indicated but a few of them—are
stined to lead to very important consequences.

During the recent war we were all abundantly patriotic. High
ficers of state, country gentlemen, and ministers of the Gospel, all
ok their own ways of stimulating the martial ardour of the people,
id of inducing them to swell the diminished ranks of the army.
ut if its administration continues as faulty, in many respects,
it is now known to be; if to march to the sound of the drum be
terrible illustration of Longfellow's assertion that our hearts

> "Are beating
> Funeral-marches to the grave;"

> "In the world's field of battle,
> In the bivouac of life,"

e incur only about half the risk which proves so mortal to the
ldier at home, will men of benevolence urge men of thews and
iews to devote their sturdy arms to the military defence of the
ngdom? Moreover, there is another consideration which comes
pecially home to most of the readers of this Journal, and to all
terested in agriculture. About one-half of our army consists of
en originally connected with the cultivation of the soil. The
straction of so many men from rural pursuits must always affect
e farmer's ability to procure a sufficiency of labourers, and, in
mbination with other causes, is apt to cause him serious embar-
ssment, particularly in a time of war. A reasonable agricul-
rist will never grudge being subject to personal inconvenience
cessitated by the exigencies of the State; but, considering the
esent condition of the labour market, he has a right to complain
at the cultivation of the soil is rendered unnecessarily expensive
consequence of the preventible mortality of the army. One-

half of the recruits annually withdrawn from the pursuits of civil life would not be required, if military mortality were in the same proportion as that common to the general community. And as half of those soldiers who prematurely perish from what, in one sense, may be called home-sickness, are originally from the country, it is evident that the connection between the plough and the sword is closer than the farmer may at first imagine; and that, consequently, he ought to be much obliged to us for the trouble we have been at in digesting for his benefit such a bulky tome as the Report of the Commissioners on the Sanitary Condition of the Army. We have just paid several Forfarshire labourers at the rate of 2s. 4d. per day for draining. If this rate go on increasing, we leave our agriculturists to reflect whether they can afford it, and to determine, by means of the data which we have supplied in the course of this article, how much of the increase is to be ascribed to excessive mortality and sickness in the army.

THE TOWN-SEWAGE QUESTION.—NO. II.

By Robert Scott Burn.

A series of appendices are given in the Report on Metropolitan Drainage, on the agricultural value of sewage, being emanations from, or the result of examinations of, gentlemen who have given attention to the subject. Of communications, one from Dr Gilbert, well known for his experiments on the subject in conjunction with Mr J. B. Lawes, abounds in suggestive information. On the general consideration of the agricultural value of sewage manure, both liquid and solid, he has some remarks, a *resumé* of which may here be valuable. As to the "high manuring value" of the constituents of London sewage, Dr Gilbert states that he and Mr Lawes have come to the conclusion that, if they "could be conveniently applied for the production of corn, they would return somewhere about one-third of the wheat consumed by its population." But from the immense dilution with water which these constituents are treated, it is impossible to estimate their practical value according to their chemical composition, as is done with concentrated manures. "Perhaps the best way," says Dr Gilbert, "of conveying a clear idea on this point is to state that, if the solid and liquid excrements of each individual of a mixed population are supposed to be mixed with water (by supply and rain-fall), at the rate, on the average, of 50 gallons per head per day, we should then have only nine ounces of the dry substance of human excrements distributed in each ton of the water. By a similar mode of calculation, every ton of the dry matter of the excrements, which, if obtainable in a portable condition free from any admixture, would be worth rather more than a ton of the best Peruvian guano, would in the form of

sewage be diluted with nearly 4000 tons of water." Hence arises the difficulty, or rather the cost, of distributing—and, by consequence, the reduction of the practical value—a manure in which £15 sterling of valuable constituents is diluted with 4000 tons of water; and further, the different circumstances which arise in considering the *method* of its distribution as compared with that of the dry and pure excrementitious matter, the same value of which is comprised in a ton-weight only. But this difficulty and cost of distribution are not the only disadvantages arising from the enormous dilution with water of the manurial matters. For if the constituents could be obtained in a dry, portable, and non-putrescent condition, they could be shut up till required, and applied to the land at the most fitting seasons; and, more than all, they could be applied to any crop, and especially to corn. But these same constituents, with 4000 times their weight of water, must be distributed day by day, not only at the best, but at all seasons. And this matter, from the constancy with which it would be supplied, and the extent of its dilution, would be comparatively useless for grain-crops, for which, in the concentrated form of its constituents, it is the best adapted. These circumstances, therefore, narrow the question of the application of town-sewage in its ordinary form to the growth of grains, and perhaps some other succulent crops, by irrigation. Dr Gilbert closes this department of his communication with the following:—"I would here remark that it is a matter much to be regretted that the public mind should so frequently have been misled as to the application of dilute town-sewage for crops generally, by reference to the use of liquid manure on farms, where not only the amount of its fluid, but its concentration, and the time of its application, are entirely under control. With the very different circumstances of town-sewage vanishes entirely the foundation for any conclusions regarding it from such experience as that alluded to. In the one case we have a limited amount of fluid, any desired concentration by the addition of manures, and perfect control as to the time of application; in the other, the dilution irrevocable, an immense supply constant, and the time of application almost entirely beyond control.

These considerations naturally bring Dr Gilbert to discuss the question whether the valuable matters can be separated from town-sewage in the portable form, to be sold like guano, and at something like its theoretical value. It is almost needless to state here that Dr Gilbert joins with the great majority of those who have investigated the subject in believing that this cannot be done. He says he is satisfied that "the thing has never yet been accomplished; not that, in the present state of chemical knowledge, it is absolutely impossible to accomplish it." In corroboration of this view he gives some important remarks, of which the following is an abstract:—The most important manurial constituent is nitrogen or ammonia, the per-centage of this in any sewage determining its

value. There are, doubtless, other valuable constituents; but their value is less, weight for weight, than that of the nitrogenous compounds. By far the larger proportion of the nitrogenous compounds voided are found dissolved in the liquid excrements. In sewage, these and the solid excrements are quickly diluted in water; and the tendency of the chemical changes they undergo is to convert the natural nitrogenous compounds into more, not less, soluble combinations. In fact, observation leads to the conclusion that somewhere about nine-tenths of the nitrogenous substances in sewer-water exist not merely as suspended matter, but absolutely dissolved. No chemical method has yet been discovered by which these dissolved matters can be reprecipitated in the solid form. All the excrementitious nitrogenous matter, therefore, which can be obtained in a sedimentary sewage-manure, is just that small amount which exists in an undissolved state in the fœces, to which may be added the immaterial proportion carried down mechanically rather than chemically with the sediment. Of the various methods which have from time to time been introduced for obtaining a solid portable manure from town-sewage, Dr Gilbert thinks the "lime method" by far the best. This, as stated in our last article, is carried out principally at Leicester. All analyses of manures manufactured in this process show, however, in the small amount of nitrogenous matter which they contain, the accuracy of the chemical opinions as to the non-paying capabilities of the solid form of sewage constituents. "In fact," says Dr Gilbert, "so small is the amount of valuable manurial constituents shown to be contained in such solid sewage-manures, that they could only be useful if applied to the land in several times as many tons per acre as would be required in hundredweights of guano or the pure dry excrement. It is obvious that such a manure would, on account of the cost of carriage, command no price at all beyond a very limited distance from its place of manufacture."

On this latter point, the rapidly decreasing value of solid sewage manure as the distance from the place of manufacture increases, Messrs Hoffmann and Witt, in their report, to which we have frequently alluded, give some very interesting details. Assuming the lime process of the Leicester Works to be the best, and taking the patentee's estimate of cost of materials, it appears that a ton of lime-deposit can be made at a cost of 12s. 8½d. "According to this calculation, we should succeed in manufacturing, by an outlay of 12s. 8½d., a manure, the fertilising power of which would be equivalent to a quantity of guano costing £1, 18s. 8¾d., leaving a net profit to the manufacturer of £1, 6s. 0¼d. per ton." But the possibility of realising this involves the assumption that the farmer would feel inclined to pay for a certain weight of fertilising substances, with the addition of four times its weight in useless matter, exactly the same price as for a concentrated manure in the form of guano. The additional weight of the lime-deposit becomes a

very serious matter when we come to consider the cost of carriage. Assuming the cost of loading and carriage per mile to be on an average 1s. per ton, and of spreading 9d. per ton, and taking the value of guano at £11 per ton, and of the lime-deposit at £1, 18s. 8¾d., it is obvious that, to put on a field the same quantity of fertilising matters which is contained in a ton of guano, not less than six times the quantity of the lime-deposit would have to be used. In this case the works at which the lime-deposit is manufactured are supposed to be at the banks of the river at which the guano is delivered at the cost above noted. The following table shows the estimated cost of spreading on a field lime-deposit which will give the same amount of fertilising matter as imparted by one ton of guano:—

	In the form of Guano.	£	s.	d.	In the form of Lime-Deposit.	£	s.	d.
In the immediate neighbourhood	1 ton of guano,	11	0	0	6 tons of lime-dep.,	11	0	0
	Spreading,	0	0	9	Spreading,	0	4	6
	Total,	11	0	9	Total,	11	4	6
At a distance of 5 miles from the works	1 ton of guano,	11	0	0	6 tons of lime-dep.,	11	0	0
	Carriage,	0	5	0	Carriage,	1	10	0
	Spreading,	0	0	9	Spreading,	0	4	6
	Total,	11	5	9	Total,	12	14	6
At a distance of 10 miles	1 ton of guano,	11	0	0	6 tons of lime-dep.,	11	0	0
	Carriage,	0	10	0	Carriage,	3	0	0
	Spreading,	0	0	9	Spreading,	0	4	6
	Total,	11	10	9	Total,	14	4	6
At a distance of 15 miles	1 ton of guano,	11	0	0	6 tons of lime-dep.,	11	0	0
	Carriage,	0	15	0	Carriage,	4	10	0
	Spreading,	0	0	9	Spreading,	0	4	6
	Total,	11	15	9	Total,	15	14	6
At a distance of 20 miles	1 ton of guano,	11	0	0	6 tons of lime-dep.,	11	0	0
	Carriage,	1	0	0	Carriage,	6	0	0
	Spreading,	0	0	9	Spreading,	0	4	6
	Total,	12	0	9	Total,	17	4	6
At a distance of 25 miles	1 ton of guano,	11	0	0	6 tons of lime-dep.,	11	0	0
	Carriage,	1	5	0	Carriage,	7	10	0
	Spreading,	0	0	9	Spreading,	0	4	6
	Total,	12	5	9	Total,	18	14	6

From this table it will be obvious that, if the manufacturer sold the lime-deposit at £1, 18s. 8¾d. per ton, "*it would be cheaper, even in the immediate neighbourhood of the works, to employ guano,* on

account of the greater cost of spreading the more bulky manure; and the saving effected by its use, as compared with the lime manure, would rise rapidly with the increase of distance from the works." The rate at which the price of the lime-deposit will have to be reduced will be seen by supposing the extreme case in the table—namely, the distance of 25 miles. The cost of carriage and spreading alone come to, from this distance, no less a sum than £7, 14s. 6d.; the cost of guano, *including* carriage and spreading being, for the same distance, £12, 5s. 9d. The manufacturer of the lime-deposit cannot look for a higher price than £4, 11s. 3d. for the 6 tons, or 15s. per ton; the cost of production of the same being 12s. 8½d., leaving a profit of 2s. 3½d. per ton only. But this profit appears only with experiments as to the value of the lime-deposit made on a small scale; it disappears when we take the value of the lime-deposit as produced in practice on the large scale. For the purposes of the computation, Messrs Hoffmann and Witt select the example offered by the Leicester Works, in which, under the able management of Mr Wickstead, C.E., the whole arrangements are of the most perfect description, and thoroughly calculated to produce the deposit at the lowest possible cost. The following are two analyses of the composition of the Leicester sewage-manure, which is manufactured, for the purposes of easy storage and carriage, in the form of bricks. The first analysis is by Dr Voelcker, the second by Mr Versmann:—

Water,	10.52
Organic matter,	12.46
Insoluble silicious matter,	13.50
Sulphate of lime,	1.76
Oxides of iron and alumina,	2.89
Carbonate of lime,	52.99
Carbonate of magnesia,	3.67
Chloride of sodium,	0.45
Potash,	0.26
Phosphate of lime (3 Ca. O. P. O^5.),	2.27
	100.77

Nitrogen, 0.60 per cent; Ammonia, 0.72 per cent.

BRICKS OF THE SEASON 1856.

IN ITS ORIGINAL STATE.	Per Cent.	OTHERWISE STATED.	Per Cent.
Water,	40.6	Water,	4.06
Organic matter,	26.32	Organic matter,	26.32
Lime,	28.32	Carbonate of lime,	46.10
Magnesia,	1.07	Sulphate of lime,	2.35
Potash,	0.46	Phosphate of lime,	2.32
Soda,	0.74	Sulphide of calcium,	0.38
Iron and alumina,	3.83	Carbonate of magnesia,	2.25
Sulphuric acid,	1.38	Chloride of potassium,	0.61
Chlorine,	0.29	Carbonate of potash,	0.10
Phosphoric acid,	1.07	Carbonate of soda,	1.26
Carbonic acid,	22.02	Iron and alumina,	3.83
Sulphur,	0.17	Silica and insoluble residue,	10.42
ica and insoluble residue,	10.42		
			100.00

Nitrogen, 0.560 per cent; Ammonia, 0.680 per cent.

From Dr Voelcker's analysis (No. I.), the value of the Leicester bricks per ton is 15s. 5d.; from Mr Versmann's it is shown to be 17s. Assuming 18s. to be the value, so that it would take 12½ tons to give the same amount of fertilising matter as one ton of guano, we shall be prepared to see the relative cost of applying the bricks and guano as a manure. The following table, prepared by Messrs Hoffmann and Witt, shows this:—

	In the form of Guano.	£	s.	d.	In the form of Leicester Bricks.	£	s.	d.
At the Factory,	1 ton of guano,	11	0	0	12½ tons of Leicester bricks, ...	11	0	0
	Spreading, .	0	0	9	Spreading, ...	0	9	9
	Total, . .	11	0	9	Total, ...	11	9	9
At the distance of two miles,	1 ton of guano,	11	0	0	12½ tons of Leicester bricks, . . .	11	0	0
	Carriage, . . .	0	2	0	Carriage, ...	1	5	0
	Spreading, . .	0	0	9	Spreading, ...	0	9	9
	Total, . .	11	2	9	. Total, ...	12	14	9
At the distance of five miles,	1 ton of guano,	11	0	0	12½ tons of Leicester bricks, ...	11	0	0
	Carriage, . . .	0	5	0	Carriage, ...	3	2	6
	Spreading, . .	0	0	9	Spreading, ...	0	9	9
	Total, . .	11	5	9	Total, ...	14	12	3

"From this it is evident that, in order to find for a sewage lime-manure similar to the Leicester bricks a market at a distance of five miles from the works, 12½ tons of it must be offered to the farmer at the same price as one ton of guano, *plus* the cost of the spreading,—*i.e.*, £11, 5s. 9d. The manufacturer must therefore be satisfied at the works with £7, 13s. 6d. (*i.e.*, £11, 5s. 9d. *minus* £3, 12s. 3d.); that is, with 12s. 3d. per ton, which is 5½d. less than the cost of its production (12s. 8½d.) In other words, the use of the lime-deposit as a manure will be impossible even at so small a distance as five miles from the works; and if the manufacturer were satisfied with the most moderate profit, the sale of the manure would be limited to an area of two miles radius."

The preceding investigations have shown that, apart from bulk—which, by the way, does exercise an influence upon the commercial value of the manure—12½ tons of the lime-manure and 1 ton of guano have an equal chance in the market, so far as fertilising properties are concerned. "But," ask the experimenters, "would this really be the case? Might not the agriculturist hesitate, in many cases, to apply to his field, together with the valuable fertil-

ising constituents, so large a quantity of inert matter—lime, for instance?—and might not this large quantity prove, moreover, positively injurious, or at all events likely to obstruct the process of disintegration, and the diffusion of manure through the soil? Would not the farmer frequently prefer the guano, not only on account of its greater concentration, but also of its containing a portion of its valuable constituents—phosphates especially—in a soluble state, whilst the lime-deposit presents them in the insoluble condition? Would it not be far easier to control, by chemical estimation, the composition of the guano and concentrated artificial manures in general, than the large quantity of bulky and weak lime-manure—the value of which, by the use of an undue quantity of lime, might in fact be reduced to a mere nothing? And lastly, would it not be infinitely more difficult to adjust the lime-manure according to the requirements of a special piece of land, or of a given crop, than the far more manageable guano?"

Of the various media with which town-sewage has been proposed to be treated for the purpose of obtaining a valuable manure, charcoal is the most important. Its powers of "surface-attraction" have been long known, and have made it marked as an efficient deodoriser and disinfectant. These powers manifest themselves in two ways,—first, by "the absorption of gases;" and second, by "removing organic and even saline bodies from solution in water." De Saussure long ago showed that charcoal absorbed different gases in varying proportions. Boxwood charcoal absorbed of

Ammonia gas,	90	times its own volume.
Hydrochloric acid,	85	"
Sulphuretted hydrogen,	81	"
Carbonic acid,	35	"
Oxygen,	9.25	"
Nitrogen,	7.5	"
Hydrogen,	1.75	"

The high proportion of ammonia and sulphuretted hydrogen which charcoal absorbs, as shown by the above table, points it out at once as a strikingly powerful medium for the treatment of town-sewage. Various plans, therefore, have been from time to time proposed, by which a valuable manure might be obtained from town-sewage by its treatment with charcoal. For a notice of the various patents taken out from time to time, in which this material forms a leading feature, we refer the reader to the number of the Journal for July 1857, in the article on "Patent Specifications relating to Manures."

It is upon its power for removing organic and saline bodies from water that charcoal is made available as a means of separating from town-sewage its valuable constituents. In experimenting upon the plan proposed, with a view to elucidate the value of the products as manures, Messrs Hoffmann and Witt thought that the practical ends would best be served by adopting two different modes

of proceeding, namely—(1.) Simple Filtration of the Sewage through charcoal; (2.) Agitation of the Sewage with charcoal.

In experimenting upon the first method, it appeared to the reporters that it would be of some interest to compare the effect of charcoal as a filtering medium with another material—*sand*—which is generally looked upon as exercising an exclusively mechanical effect. Two filters, therefore, of equal area, were prepared—one containing peat charcoal, the other sand, resting on thin layers of fine and coarse gravel: the thickness of the sand and charcoal was 1 foot. The quantity of sewage run through each was carefully regulated, so that both filtrations were similarly performed, and side by side. The extraordinary powers of charcoal soon displayed themselves; for, while the liquid which had passed through the sand, although having lost the greater portion of its suspended matter, was decidedly turbid, and little less offensive in smell than in its original condition, the liquid passed through the charcoal was transparent, colourless, with little odour, and comparatively tasteless.

Two hours after the commencement of the experiment, the filtrate from the sand had not altered in character, whilst that from the charcoal was as clear as before. Four hours, however, after the experiment had commenced, a decided change in the filtering powers of the charcoal was observable, the filtrate having become turbid, whilst that from the sand remained apparently unaltered. It might have been desirable to have continued the experiment, for the purpose of ascertaining the rate at which the filtering powers of the charcoal diminished; but it was deemed sufficient to "have experimentally confirmed once more the fact of the rapid diminution of the absorbent power of charcoal for substances dissolved in water."

The quantity of sewage passed through the sand was 80.61 gallons, or 22,354 cubic inches; the quantity passed through the charcoal, 77.76 gallons, or 21,562 cubic inches. The sewage passed through the sand at the rate of 8 ounces, and through the charcoal at the rate of 6.3 ounces, per minute. The following is the composition of the sewage which was passed through the filter:—

		Grs. per gall.
Suspended matter,	Mineral,	21.48
	Organic,	35.42
Total of suspended matter,		56.90
Dissolved matter,	Mineral,	56.08
	Organic,	28.13
Total of dissolved matter,		84.21
Total solid constituents,	Mineral,	77.56
	Organic,	63.55
Total of solid constituents		141.11

The results of two hours' filtration through charcoal showed that, when at its maximum efficiency, charcoal has the power of separating from sewage by filtration a larger amount of the matter than precipitation either by lime or by a mixture of lime and sulphate of alumina; inasmuch as it removes not merely the *suspended* matter, but "also a fair per-centage of the *dissolved* matter." The first of the two following tables shows the "effect of charcoal filtration after two hours;" the second, contrast of the "dissolved matter" removed by the charcoal:—

(I.)

	Total amount of solid constituents originally present.	Amount present in filtered liquid.	Amount separated.	Amount separated. Per-centage of quantity originally present.
	Grains per gall.	Grains per gall.	Grains per gall.	
Mineral matter, . .	77.56	48.31	29.25	37.71
Organic matter, . .	63.55	12.57	50.98	80.22
Total, ...	141.11	60.88	80.23	56.85

(II.)

	Amount of matter separated.	Suspended matter originally present.	Dissolved matter removed.	Dissolved matter removed. Per-centage of quantity originally present.
	Grains per gall.	Grains per gall.	Grains per gall.	
Mineral matter, . .	29.25	21.48	7.77	13.85
Organic matter, . .	50.98	35.42	15.56	55.31
Total, ...	80.23	50.90	23.33	27.70

[illegible] apidly the absorbed power of the
[illegible] hours' filtration, "it had ceased
[illegible] tirely and, in fact, the liquid
[illegible]

EFFECT OF CHARCOAL FILTRATION AFTER FOUR HOURS.

	Total amount of constituents originally present.	Amount passed in filtered liquid.	Amount separated.	Amount separated. Per-centage of quantity originally present
	Grains per gall.	Grains per gall.	Grains per gall.	
Mineral matter, . .	77.56	63.77	13.79	17.78
Organic matter, . .	63.55	34.76	28.79	45.35
Total, ...	141.12	98.53	42.59	30.18

	Amount separated.	Suspended matter present.	Suspended matter which passed through.
	Grains per gallon.	Grains per gallon.	Grains per gallon.
Mineral matter, ...	13.79	21.48	7.68
Organic matter, ...	28.79	35.42	6.62
Total, ...	42.59	56.90	14.31

"No less than 14.31 grains of the suspended matter now passed through, showing to what a state of inefficiency, as a merely mechanical filter, the charcoal had arrived in the short space of four hours; but it must not be supposed that on that account it had altogether lost its peculiar powers of removing the dissolved matter: in all probability it had not. This could, of course, have been ascertained by determining the proportion of dissolved and suspended matter *in the filtered liquid;* but it had very little bearing on the present inquiry, and was therefore omitted."

The following is the table showing the effect of sand filtration after two hours:—

	Total amount of solid constituents originally present.	Amount present in the filtered liquid.	Amount separated.	Amount separated. Per-centage of quantity originally present.
	Grains per gall.	Grains per gall.	Grains per gall.	
Mineral matter, . .	77.56	51.14	26.42	34.07
Organic matter, . .	63.55	32.11	31.44	49.46
Total, ...	141.12	83.25	57.87	41.00

In this filtration, the whole of the suspended matter was not removed, unlike that of the charcoal, in which the amount of dissolved matter removed was obvious. Experiments were therefore necessitated to determine, in the case of the clay filtration, the proportion of suspended to dissolved matter in *the filtered liquid.* The following is a table showing this:—

	Composition before filtration.	Composition of the filtered liquid.	Amount separated.	Amount separated. Per-centage of the quantity originally present.
	Grains per gall.	Grains per gall.	Grains per gall.	
Suspended matter, Mineral,	21.48	0.66	20.82	96.90
Suspended matter, Organic,	35.42	1.62	33.80	95.43
Total, ...	56.90	2.28	54.62	95.98
Dissolved matter, Mineral, .	56.09	50.48	5.610	10.02
Dissolved matter, Organic, .	28.13	30.49	nil.*	...
Total, ...	84.25	80.97	...	...
Total, Mineral, .	77.57	51.14	26.43	34.07
Total, Organic, .	63.55	32.11	31.24	49.46
	141.12	83.25	57.87	41.00

The following table shows the effect of sand filtration after four hours:—

	Total amount of solid constituents originally present.	Amount present in filtrate.	Amount separated.	Amount separated. Per-centage of the quantity originally present.
	Grains per gall.	Grains per gall.	Grains per gall.	
Mineral matter, . .	77.57	58.29	19.28	24.86
Organic matter, . .	63.55	32.18	31.37	49.36
Total, ...	141.12	90.47	50.65	35.89

* In fact, some little amount of the organic matter which had been previously removed from solution was released from its state of combination with the sand, probably by the superior attraction for the suspended or mineral matter presented to it in the later stages of the experiment.

	Amount separated.	Suspended matter originally present.	Suspended matter which passed through.
	Grains per gallon.	Grains per gallon.	Grains per gallon.
eral matter, . .	19.28	21.48	2.20
mic matter, . .	31.37	35.42	4.05
Total, . . .	50.65	56.90	6.25

om those experiments it will be seen that, although char- possesses molecular attraction in a higher degree than that of yet it loses this, and also its efficacy, in arresting suspended r much more quickly. The following are the conclusions to the reporters came to, with reference to the efficiency of oal as compared with an ordinary mechanical filter as sand:—

t, That charcoal possesses the power of removing *organic matter* from to a far greater extent than sand; the largest per-centage removed charcoal being 80.22, whilst the sand only removed, when in maxi- action, 49.46 per cent of the organic matter originally present from me sample of sewage. This is quite in accordance with the statements r observers.

l, That charcoal also possesses the power of removing *mineral matter* ewage to a somewhat greater extent than sand; the largest per-centage ed by charcoal being 37.71 per cent, whilst the sand removed, when in num action, only 34.07 per cent of the mineral matter originally t.

, That charcoal is likewise capable of removing even *dissolved* mineral ganic matter from solution to a far greater extent than sand; the per-centage removed by charcoal being, of dissolved organic matter, per cent, and 13.85 per cent of dissolved mineral salts; whilst sand ed, when in maximum action, no organic matter at all, and only 10 nt of dissolved mineral matter.

h, That the superior efficacy of charcoal is obviously due to its more structure, enabling it to expose a more extended surface; for, though al possesses both those powers in a far higher degree than sand, yet soon loses its intensity, whilst the sand continues to exert its more action for a much longer period."

order to determine the *money value* of a manure obtained by ng sewage through charcoal, it was necessary to analyse the oal before and after its action in the sewage. The following analysis of charcoal before use:—

Organic matter (carbon), . . .	95.72
Ash, ...	4.28
	100.00

lso contained 0.55 per cent of phosphoric acid. The follow- the analysis after filtration. 100 parts contain—

Nitrogen, . . .	2.032—corresponding to ammonia,		2.467
Phosphoric acid, .	0.12	" phosphate of lime,	9.26
Organic matter, including the charcoal, . .	94.069		

"It deserves to be noticed," say the reporters, "that these analyses show us, in 100 parts, the amount of matter valuable for agricultural purposes which the mass of peat-charcoal, used in our experiments, and which had an area of four square feet, and a depth of one foot, removed from 77.76 gallons of sewage, and not the amount that it is possible to accumulate in charcoal, by continuing the treatment with sewage until saturation. But when the large volume of sewage had been passed through the charcoal, its peculiar powers were to a very considerable extent exhausted, and it would have acted chiefly as a merely mechanical agent for arresting suspended matter.

"In taking the above numbers as a basis of calculation, it is but right to mention that they by no means represent the most favourable conditions for the manufacture of a manure from sewage by the agency of charcoal. If it be remembered that the effect of charcoal, both upon suspended and upon dissolved matter, is essentially the result of a surface-action, it would be obviously objectionable to waste the energy of its attraction for the valuable dissolved matter by clogging its pores with mud of much inferior value. In our experiments, which essentially represent the method hitherto adopted, a certain, although a small, amount of the force was actually spent in this manner. By far the best chance for this process would be to allow the sewage to subside—to remove the valuable dissolved matter by treatment with charcoal, and to mix the saturated charcoal with the sewage deposit obtained by simple subsidence."

The following is the calculation of the money value of charcoal after use as a filter:—

		£	s.	d.
2.467	tons of ammonia, at £56 per ton, ...	£138	3	0¼
0.26	tons of phosphate of lime, insoluble, at £7 per ton, .	1	16	5¼
1.5	tons of organic matter, at £1 per ton, . .	1	10	0
	Value of 100 tons, ...	£141	9	5¼

Or £1, 8s. 3¼d. per ton.

Another series of experiments were instituted, having reference to the *agitation of sewage with charcoal*, allowing the charcoal to subside from the sewage with the mud. "An examination of this kind promised not only to elucidate more fully the nature of the action of charcoal, but it also afforded a direct comparison of the power of charcoal upon sewage, with the now very frequently adopted method of heating sewage with lime." In experimenting, 20 grains of charcoal were used to the gallon of sewage; this being the proportion of lime generally used in the lime process, the nature and results of which we have already fully described. The charcoal was violently agitated in a close vessel for half an hour, and allowed to rest. The supernatant liquid was, after the expiration of two hours, removed by means of a syphon; samples both of the original sewage and of the liquid thus obtained being preserved for analysis. The following shows the composition of the sewage employed:—

Suspended matter,	Mineral,	. . . .	14.64
	Organic,	. . . .	25.04
	Total,	. . . .	39.68
Dissolved matter,	Mineral,	. . . .	67.26
	Organic,	. . . .	41.19
	Total,	. . . .	108.45
Total solid constituents, . . .	Mineral,	. . . .	81.90
	Organic,	. . . .	66.23
	Total,	. . . .	148.13

The following shows the results of agitation of the sewage with powdered peat-charcoal :—

	Total amount of solid matter originally present.	Amount of solid matter in supernatant fluid.	Amount of solid matter separated.	Amount of solid matter separated. Per-centage of the quantity originally present.
	Grains per gall.	Grains per gall.	Grains per gall.	
Mineral matter, . .	81.70	59.63	22.08	27.02
Organic matter, . .	66.23	31.93	34.30	51.93
Total, ...	147.03	91.56	56.38	38.10

The following is a Table of the *suspended* and *dissolved matter* :—

	Quantity originally present.	Quantity contained in the filtered liquid.	Amount separated.	Amount separated. Per-centage of quantity originally present.
SUSPENDED MATTER.				
	Grains per gall.	Grains per gall.	Grains per gall.	
Mineral matter, . .	14.44	5.09	9.35	64.75
Organic matter, . .	25.04	9.31	15.73	62.81
Total, ...	39.48	14.40	25.08	63.52
DISSOLVED MATTER.				
Mineral matter, . .	67.26	54.54	12.72	18.92
Organic matter, . .	41.19	22.62	18.57	45.07
Total, ...	108.45	77.16	31.29	28.80

The following is the analysis of the deposit obtained by agitating sewage with peat-charcoal:—

100 parts contain—

Nitrogen,	3.63	—corresponding to ammonia,		4.40
Phosphoric acid,	1.103	„	phosphate of lime,	2.389
Organic matter,	41.83			

The following is the calculation of the money value of the deposit:—

4.40	tons of ammonia, at £56 per ton,	£246	8	0
2.389	„ phosphate of lime (insoluble), at £7,	16	14	5¼
15.83	„ organic matter, at £1,	15	16	7
	Value of 100 tons,	£278	19	0¼

Or £2, 15s. 9½d. per ton.

THE FARMERS' NOTE-BOOK.—NO. LX.

Is Pleuro-pneumonia infectious?—Professor Simonds of London says that it is. Professor Dick of Edinburgh says that it is not. Our own experience agrees with the latter opinion. On the banks of the Almond, in the county of Mid-Lothian, are situated three farm-steadings, about 600 yards from the river, upwards of 60 feet above it, and 360 feet above the level of the sea, with a good southerly exposure. Milk-cows are kept in the two westmost steadings, and feeding cattle in the eastmost. About eight years ago, in the autumn, the cows in the westmost steading were attacked by pleuro-pneumonia; fiercely and fatally it raged among the stock for about two months, till the number of empty stalls in the byre showed the sad havoc which had been committed, and which the farmer did not think prudent to repair at the time. Though there was no communication held between the adjoining steadings, the disease made its appearance among the stock in the next steading, a few weeks after it had commenced in the former one. After decimating the cows here also for some time, it attacked the feeding cattle of the eastmost steading, among which it continued more or less throughout the winter. The cattle, both in courts and byres, were attacked by it; and it is worthy of remark, that some weeks before the feeding cattle were affected by the pleuro-pneumonia, the murrain went through the whole stock.

Now it is somewhat curious, that during the whole of that autumn and winter the disease lingered amongst the cattle in these three steadings, and never, in one case, travelled beyond them north, south, east, or west. In connection with the steading where the feeding-cattle were kept, there was another steading, where about twenty cattle were fed in courts, at a distance of half a mile

from the former steading, at a much higher altitude, and considerably more exposed. Not the least precaution was taken to prevent any communication between the different lots of cattle in the two steadings; on the contrary, the same servants fed them, and on the disease breaking out, all the cattle at the two steadings were bled by the same men on the same day. Not one of the cattle in the upper steading was affected by the disease, while most of those in the lower one were sold off after being attacked.

Last summer, on the same farm, two lots of cattle were grazing, the one on the fine sheltered haughs at the side of the river,—the other in an exposed field beside the upper steading, about 150 feet above the river. One after another of the cattle on the haughs were attacked by pleuro-pneumonia. The farmer, finding that none of his other cattle were affected, thought that the disease arose from the great differences of temperature to which the cattle were subjected during the day and at night. During the day, the temperature was very high in the haughs, as they were mostly surrounded by woods, and the sun beat upon them; at night, a cold chill air rose from the river. He accordingly removed the cattle from the haughs, and put them beside the others in the exposed field. There was not another case of pleuro-pneumonia on the farm during that season. In none of the cases narrated above, could the disease be traced to infection. Again has it broken out in the district without any assignable cause, excepting atmospheric; but we are glad to say that, though its ravages are as extensive as ever, the attacks are by no means so virulent, and there are more cases of recovery than formerly. We are, therefore, in hopes that, if it is to remain permanently among us, it will be in a much milder form than what we have been accustomed to; and as its course has hitherto somewhat resembled that of the vesicular murrain, it may through time become as harmless, and be regarded with less fear than it is at present.

While on this subject, we may allude to a disease mentioned by Dr Livingstone as very prevalent among horses and cattle over considerable portions of Africa. The symptoms are not described, but Dr Livingstone calls it *Peripneumonia*, for which we believe *pneumonia*, or *pneumonitis*, is now more correctly used. But the diseases of the lungs and of their covering, the *pleura*, are so often mistaken, particularly by non-professional people, that there is as great a probability of many of the cattle in Africa having died of pleuro-pneumonia, under the impression of the disease being peripneumonia, as of many cases of pleurisy, or pneumonia, being mistaken here for pleuro-pneumonia. The poisonous nature of the flesh, as mentioned by Livingstone, is particularly worthy of notice here.

"The disease called horse sickness (peripneumonia)," says Livingstone, "exists in such virulence over nearly seven degrees of

latitude, that no precaution would be able to save these animals. The horse is so liable to this disease, that only by great care in stabling can he be kept anywhere between 20° and 27° south latitude, during the time between December and April. The winter, beginning in the latter month, is the only period in which Englishmen can hunt on horseback, and they are in danger of losing all their studs some months before December. To this disease the horse is especially exposed, and it is almost always fatal. One attack, however, seems to secure immunity from a second. Cattle, too, are subject to it, but only at intervals of a few, sometimes many years; but it never makes a clean sweep of the whole cattle of a village as it would do of a troop of fifty horses.

"When the flesh of animals that have died of this disease is eaten, it causes a malignant carbuncle, which, when it appears over any important organ, proves rapidly fatal. It is more especially dangerous over the pit of the stomach. The effects of the poison have been experienced by missionaries who had eaten properly cooked food, the flesh of sheep really, but not visibly, affected by the disease. The virus in the flesh of the animal is destroyed neither by roasting nor by boiling. This fact, of which we have had innumerable examples, shows the superiority of experiments on a large scale, to those of acute and able physiologists and chemists in the laboratory; for a well-known physician of Paris, after careful investigation, considered that the virus in such cases was completely neutralised by boiling. This disease attacks wild animals also." Mention is also made of its occurring in the Barotse Valley, where it commits immense havoc among the herds, often almost entirely destroying them.

Weeds.—The presence of weeds is a sure indication of the want of drainage or of slovenly farming. And yet we find some of the best farmers complaining that, drain as they like, manure as they like, farm as well as it is possible for them to farm, still they cannot get quit entirely of these pests from their fields. Some console themselves with the thought that the ground is cursed, and that it will always bring forth thorns and thistles, in spite of the best management; but the knowledge of such a fact will not satisfy the keen farmer who is of an inquiring mind, and is ambitious to have all his fields clean. He naturally asks himself how the weeds get there? and when there, what is the best way of eradicating them? But what is a weed? It has been defined to be the "general name of any plant that is useless or troublesome:" or, according to Professor Buckman, "every plant different from the crop, and growing with the crop to its hindrance." This is a true and very general definition. According to it, a potato-plant growing amongst a crop of wheat, or a turnip amongst a crop of barley, or a plant of any of the cereals amongst a crop of a different species, and not in-

tended to be there, is a weed. But in our remarks at present, we will not take the word in such a wide sense; we will confine it to what ordinary farmers mean by a weed—viz. a wild uncultivated plant, either indigenous to the soil, or transported to it, growing amongst and injurious to his cultivated crops.

There are two classes of weeds, those which are propagated by the seeds, and those which are propagated by the roots. To the former class belong annuals and biennials; to the latter, perennials. The annuals may be indigenous to the soil, growing every year, ripening and shedding their seeds, or the seeds may be sown amongst the seed of the crop, or they may be transported to the fields by birds, the wind, or other means. Perhaps there is no more frequent source of annuals, and one less suspected by farmers, than the sowing of their seeds among the seed of the crops. We believe that were farmers more particular in the purchase of their grass and clover seeds, there would be fewer complaints about the increase of weeds in their fields. We know that several species of weeds have been imported into this country by their seeds being mixed with those of some cultivated plants, such as the flax and clover dodders, the latter of which was said to have been imported from Afghanistan with lucerne seed or trefoil. The wild-oat, also, which is such a pest in the fields in East Lothian, is often propagated in other counties by means of its seeds being amongst those of wheat and barley grown in that country. Farmers cannot be too particular in purchasing seed from East Lothian, to select those samples in which none of the grains of the wild-oat is found; for in some instances it has been known to take root in the fields in which it had been sown, from which it was most difficult to eradicate it.

If we consider the immense number of weed-seeds that are mingled among our clover and other seeds, we would be at no loss to account for the growth of these pests in our fields. Professor Buckman, to whom the thanks of agriculturists are due for the devotion of his talents and time to this subject, discovered "in a pint of clover-seed 7600 weed-seeds; in a pint of cow-grass seed, 12,600; in broad clover, 39,440; and two pints of Dutch clover yielded severally 25,560 and 70,400 weed-seeds. Supposing these samples to be sown, here were seeds enough to stock the land with weeds for many years. The farmer often goes to the cheapest market, and gets weeds for corn, and so pays exceedingly dear for what he considers a cheap bargain." If we take into account the great fecundity of some weeds, we will not feel the least astonishment at the increase of the plants when the seeds are sown, and the plants allowed to arrive at maturity. Professor Buckman has counted 8000 seeds in a single plant of black mustard, and in a specimen of charlock 4000 seeds. The common stinking camomile produces 46,000, and the burdock 26,000 seeds; and the seeds of a single plant of the common dock produced 1700 little docks. It

is a notorious fact, that a great deal of the rye-grass seed of commerce in Scotland is raised in some of the worse farmed districts, where weeds are certainly not an exception; and as it is in many instances bought and sown by the unsuspecting farmer without being properly cleaned, it is no wonder that he is often surprised and annoyed on turning up his lea to find the field overrun with weeds of all descriptions, though he had been most particular in cleaning his land before sowing it down.

It is a legitimate part of the duties of local societies to offer premiums for the encouragement of good and clean seed of all kinds. And it would increase the value of the premiums, and act as a stimulus to the merchants if the members of the societies would individually bind themselves to take a certain quantity at a price agreed upon at the first. This is a subject well worthy the consideration of all local societies, which cannot make a better use of their funds than in encouraging the cleanness and purity of agricultural seeds.

Another means of propagating the growth of weeds by seeds is the wind, which carries to immense distances winged seeds, such as those of the thistle. Here again the remedy, or rather the prevention, is in the hands of the farmer. Such weeds should never be allowed to come into seed. All the fields on the farm should be gone over at least twice in the season, so that not a single plant might escape. We have practised for some years the cutting of thistles close by the ground, or rather under its surface, and putting a little common salt on the root about the end of May. We have found this to be effectual in preventing the growth of the plant the same season again, and, in most cases, the weed has been killed by the application, so that we have never been troubled again with it. Before thistles can be extirpated in a district, every farmer must be determined in cutting them down before they come into seed. This is unfortunately very rarely the case. We know a farmer who never allows a thistle to seed on his farm; but still he cannot eradicate them, because his neighbour to the west of him never cuts them; he has determined, therefore, after this, to ask permission of his easy-minded friend to go through his fields to cut his thistles for him.

Another means of spreading weeds over the farm is the dunghill. Many farmers pursue the laudable practice of cutting the grass along their hedge and ditch sides, and put into their dunghills either to be consumed by animals, or to be mixed among the dung. This is very good if the grass was only cut in time—that is, before the weeds growing amongst it were in seed; but it too often happens that this operation is performed after the turnips are all sown, and the men having nothing else to do before harvest; by that time many weeds are in seed, which is scattered [illegible] the fields [illegible] dung is applied to the land. Prevention

is better than cure here—let the grass be cut earlier. Again, fields often become so dreadfully run over with annual weeds, such as chickweed, charlock, &c., from the shedding of the seed, that the cultivated crops were checked by them; and they have been so bad in some soils favourable to their growth that we have known the best farmers baffled by them so long as they continued to farm according to a regular rotation. We believe that the best plan in such a case is to begin with a summer fallow: let the weeds be allowed to grow till the first flowers are formed before the field is ploughed in spring; then after the soil has been turned up, it is likely that there will be a second crop from some of the seeds being deep buried and only now brought into conditions favourable for vegetation: this second crop should also be ploughed down in like manner; if wheat or any other cereal is sown after the fallow, it should be drilled. But it may be necessary to take a green crop after the fallows, so that every opportunity may be given to the seeds which may be in the soil to germinate, by which means their vitality will be destroyed. It will be as well always to drill the crops, both green and white, on soils which are much given to produce annuals.

Considerable management is required to get rid of weeds which are propagated by roots, such as dorbs, thistles, quickens, knot-grass, &c. It has been observed that, since the use of the grubber has become more prevalent, many of these weeds, such as the dock and the butter-cup, have increased in our fields; and the reason given for this is, that the grubber is not the implement best adapted for eradicating them, as its tines either cut through the roots below the surface, or slip past them. The plough has been found far more effectual, particularly for the butter-cup or ranunculus species, than the grubber. Docks and thistles can be best got rid of by pulling them in wet weather when the ground is soft, gathering them into heaps to be mixed with hot lime. Where autumn grubbing is practicable, it may be done with great advantage and profit in assisting to eradicate such roots as quickens. But as the proper cleaning of land by means of implements presupposes it to be in a dry state, and it cannot always be got into that desirable condition in autumn, grubbing then cannot be recommended for every district and soil. It should always be borne in mind, that the effect of grubbing is to harden the soil below, even when the operation is performed when the soil is dry, and particularly when it is in the least damp. The fork will be found to be of far more service than any other instrument in rooting out knot-grass. Where this weed is known to exist, women should be set to work to dry it out with forks immediately after the crop is removed. The roots and knots being then fresh, will be lifted with less risk of any of the knots being broken off. In dealing with the roots of these weeds, it should always be borne in mind, that every knot, and

every half-inch of quicken or dock-root, is a root of itself, so that great care should be taken not to break them into pieces.

Fluke Potato.—Edward Bennett, gardener, Perdisewell Hall, Worcester, writes in the *Cottage Gardener* respecting this variety of potato :—

"Until 1854 very little had been heard of this potato, so that, I apprehend, many will be greatly astonished when I point out that it is now sixteen years since it was first raised from seed. It is supposed by some persons to be a cross between the *Pink Eye and Lapstone Kidney;* but the following statement plainly contradicts it: John Turner, a hand-loom weaver, and occasionally a farm labourer of Birch, near Middleton, Lancashire, first raised the fluke potato from a seed-apple, taken indiscriminately from a field of potatoes grown on the Langley Hall farm, and near his residence, in 1841. He sowed the seed in his own small garden, and it produced twelve plants, one of which was the fluke; the others being of little value, he threw away. He grew the fluke several years, and occasionally made presents of tubers to his friends; amongst others to a neighbouring farmer, who has sold large quantities of them; but Turner himself never made one farthing by them in the way of trade.

"In 1852, a subscription was got up for him chiefly through the exertions of Oswald Dicken, Esq., surgeon, of Middleton, and Mr John Lanckshire, farmer of Little Heaton, to which the Earl of Derby subscribed £10, and the Earl of Wilton £5. The amount raised was £115, with which a small life-annuity was purchased for him; but this he only enjoyed a very short time, as he died on the 28th of February 1854, aged 72 years. As before stated, Turner never knew from what variety he took the seed-apple; but the proprietor of the Langley Hall farm says, he never grew the lapstone, neither was it ever grown in the neighbourhood; but at the time the seed was taken he was growing the pink-eye, and to this variety the fluke has some resemblance, more especially in the eye."

There is strong evidence for supposing that the fluke potato has been raised from the seed of some cultivated variety, whether the above be the true history of it or not; and we see no reason to doubt its authenticity. It was for some time reported that it was a new variety imported from America by a Liverpool seedsman. We have never heard this report contradicted, but that does not at all effect the statement we have made—viz. that the fluke potato bears strong evidence of being raised from the seed of some cultivated variety; we care not whether America or England be its birthplace. It is evidently a cross; and the statement made in the foregoing account of its history—viz. that twelve plants were produced from the seed, only one of which, the fluke, was of any value, is quite in unison with the experience of all who have tried to raise potatoes from seed. Seldom are two potatoes of the same variety produced from the seeds of one apple. And cultivators [illegible] careful afterwards as possible in raising one particular [illegible] quite distinct in character

will be found in the succeeding crops. We have now cultivated the fluke for four years, and every year a variety quite different from it in form, in habit, and in its culinary properties, has been greatly on the increase. And it is a fact worth mentioning, that while every year the tubers of this variety suffered severely from the disease, scarcely has one of the fluke been affected by it. Those stems raised from the fluke have always produced apples, which the other did not. We find, on making inquiry at some friends in England who have cultivated the fluke extensively, that they have observed the increase of the other variety on the crop. The fact of the fluke or cross itself producing other varieties, agrees with the experience of both cultivators of plants and breeders of animals, who are uncertain as to what will be the character of the produce when crosses are the parents. We have this season been most careful in separating every variety from the flukes, and planting the latter by themselves, and will wait with interest for the result.

AGRICULTURAL SUMMARY FOR THE QUARTER.

It is seldom that we have to record such favourable weather for the agriculturist as that which has prevailed during the last quarter. Since the frost and snow, which we had in the beginning of March, and which may be said to have been all the winter we had last season, we have had, upon the whole, weather most suitable both for the operations and the crops of the agriculturist. The seed was not long deposited in one of the finest seed-beds, when it sprung forth into a most vigorous braird, which grew with great rapidity for the first two or three weeks. The high price of guano prevented much of it being used with the cereals, and the sickly hue so characteristic of the month of May, was very observable on many fields of oats and barley. We think that, from the present prices of grain and guano, farmers have acted most judiciously in using so little of it for the grain crops. The open winter brought the wheat to an unprecedented state of forwardness and luxuriance, to such a degree as to cause alarm to the farmers; means were resorted to to thin it out as much as possible, but even yet the crop is too luxuriant and thick, and a wet summer will be attended with most disastrous consequences to it. The barley and oats maintain the same vigorous growth which they had from the beginning, and altogether the crops may be said to be a fortnight earlier than usual.

Everywhere as yet the potato crop looks strong and healthy, with few blanks. The turnips have been got earlier sown than usual. Those sown about the beginning of May, which brairded rapidly enough, received a considerable check from one or two

frosty mornings; but fortunately a sufficient number of plants were left, so as to prevent the necessity of their being sown over again. In Perthshire and other districts we regret to hear that the fly was active at work, inflicting great damage on the crop, to such an extent as to oblige farmers to harrow down the drills and sow them over again. The hay crop is not so heavy as might have been expected from the favourable weather we have had. This has arisen very much from a scarcity of clover-plants. We observe a great many weeds amongst it, the seeds of which have evidently been sown with the grass-seeds, to the selection of which farmers do not pay sufficient attention.

The markets for all kinds of farm produce, excepting for that of the dairy and for lean stock, have remained dull and low. The effects of that false prosperity which has existed for some years, is now being felt by all classes in the country. Trade and manufactures have improved but little throughout the quarter, and consequently the agricultural interest is depressed. The large stocks of wheat on hand, both here and on the Continent, give but small hopes of a rise in prices soon; but we do not think that the markets will be at all affected by what is in the hands of farmers in Scotland, for we have seldom seen the stackyards so thoroughly thrashed out. Any material change in prices now will depend very much on the state of the growing crop and the harvest. Mutton, more than anything else, has commanded a good price of late, for which the scarcity of the article alone can account. It was expected that beef would rise much more in the end of May and beginning of June than it had done; but the limited demand, as compared with that of last year at the same time, was not taken into calculation, and hence many have been disappointed. The unusually high price of dairy produce excites some surprise; but when we inquire into the subject, we will find that there are sufficient reasons for it. We regret that we should have it to say that one of the causes of the high price of fresh butter is the great destruction among milch cows by the pleuro-pneumonia: not only have many byres in towns been several times cleaned out, but not a few farmers have had to deplore the same sad event; so that while for some years the consumption has been going on increasing, there has been no increase whatever in the supply. The high price obtained for lean cattle has also had a material effect in raising the price of dairy produce, for no farmer will submit to all the annoyances and labour attendant on the management of the dairy, if he can be as well paid by the rearing of stock, as he has no doubt been for some years back. Another cause of the high price of dairy produce is the immense exportation which has taken place to Australia. The repeal of the Corn Laws, and the high price of grain we have had for some years, have been other causes; for the farmers on the Continent, finding a free market in this country

thrown open to their produce, and remunerative prices obtained also for them, turned up a great part of their grass lands, thus reducing the supply of salt butter and cheese, and increasing that of grain. This is in some measure no doubt the cause of the present disparity between the prices of corn and butter and cheese. Lean cattle have risen so much in value as to hold out but small prospects of profit to the grazier and the feeder. Indeed, in many parts of Perthshire and Aberdeenshire, the pastures have not nearly their complement of stock, and many graziers prefer allowing the grass to waste to buying in stock at present prices.

Fiars Prices.—The state of the law on this important subject has engaged the attention of many public bodies during the last quarter. Indeed, there cannot be said to be any law on the subject, as it is only by an Act of the Court of Session that the sheriffs are empowered to proceed. The unlimited power intrusted to the sheriffs, and the want of unity of action among them, have produced a state of matters anything but satisfactory, or of advantage to the public. In no two counties is the mode of striking the fiars the same; and though the results are always published together, it is impossible to form any opinion of the comparative prices of grain in the different counties, for the methods practised of obtaining these results are sure to produce results which are put beyond the possibility of comparison. And if to this we add the bad feeling and jealousy which are engendered among the parties interested in the striking of the fiars, we are not at all surprised at the anxiety manifested in all quarters for immediate legislation on the subject. The county of Edinburgh has taken up the question evidently with the determination of carrying out the suggestions proposed by a committee of gentlemen, who were appointed to investigate the subject; and we think that there is no county in which there is greater need for a change than the metropolitan one.

The committee propose that the fiars should no longer be struck by jury; the sheriff is to be the party intrusted with the procedure as at present, who, with the assistance of some practical men and an accountant, if he consider it necessary, is to take the place of the jury. The time of striking them is to be in June instead of March, and the whole of the grain sold between the 1st of September and the 31st of May is to be taken into account. Quantity of grain sold is to be made the basis of the calculation, and not the number of sales. Schedules to be issued to every tenant paying L.50 of rent or upwards, in which are to be entered the date of every sale within the period specified, the quantity of grain sold, the weight per quarter, and the price. A penalty of L.5 to be exacted from the tenant for not returning the schedule, and L.100 penalty for every false entry. The sheriff to have power to examine on oath all persons sending in schedules, and

to call on all clerks in counties to furnish him with returns of grain sold within the period above mentioned. For five years the fiars to be struck both according to the present and the proposed system, and the sheriff, at the end of the period, to ascertain and declare the average difference between the old and new fiars prices, and the rate at which grain rents payable under leases now current, and grain for duties payable under charters already granted, shall be converted from the one to the other. These proposals have been sent to other counties, some of which have expressed a favourable opinion of them, while others have delayed the subject for consideration.

They are no doubt decided improvements on the present system, but they are by no means perfect. It is quite right that the time for striking the fiars should be lengthened out; for the present plan of taking the sales made only during three or four months, leads to many devices for raising or depressing the prices during these months, according to the interests of the parties affected. The taking of the whole grain sold, and making the quantity sold the basis of the calculation, is also a decided improvement. We question much, however, the policy of striking the fiars by means of an accountant, not in the presence of a jury. Will this satisfy all parties? May not questions arise as to damaged grain being returned in the schedules? How, then, can these points be ascertained if the witnesses are not present to give evidence on oath? Another decided objection is the time allowed for taking the comparative values between the fiars struck according to the present system, and those struck according to the proposed plan. Five years is much too short, and might lead to great injustice. These objections, no doubt, can be easily remedied; and we hope that, as there has been such a good beginning, the counties and the public will find it their interest to second the efforts of the proprietors in the county of Mid-Lothian in effecting so important a change.

Bothies and Cottages.—The bothy system has been frequently brought before the public of late by decisions in law-courts, discussions in ecclesiastical courts, and articles and correspondence in newspapers. It is well that the question is kept alive by these means, as the constant exposure of the evils will tend to the remedy of them. However desirable it may be to do away with the system, we are afraid that we cannot look for its immediate extinction, under present circumstances; but the efforts of every friend of the agricultural labourer, and every lover of his country, should be devoted to the immediate improvement of the bothies, with the ultimate view of their abolition. The decrease of the agricultural population may well excite alarm, not only among farmers, but the community; and every means should be adopted to substitute cottages for bothies, and to encourage the employment of married men and their families; and no trouble spared to blot out what is so disgrace-

ful to the district in which the old-fashioned bothies exist, and to the proprietor on whose estate they are built. We are glad to find that the exertions of the Association for the Improvement of Agricultural Cottages have been crowned with such success in the improvement of the bothies and cottages, and in the bettering of the condition of farm-labourers. We would advise all interested in this subject to do themselves the pleasure of perusing the last report of this flourishing Association.

We lately had brought under our notice a case regarding the accommodation required by law for the parochial schoolmaster; and as the accommodation in the house occupied by any one is generally a criterion of the position which he occupies in society, this case is also an illustration of the position expected by the law to be held by the parochial schoolmaster. It has been long generally known that the Act by which the salaries of schoolmasters are regulated enjoins the heritors to erect houses for them containing "not more than two rooms." This was tantamount to saying that their income, education, and general position in society, was such that it was not judicious to allow them to have a larger house. It would be well for most Scotch landed proprietors were the Legislature to show the same kindly parental interference towards them regarding the size of their houses; for who of them has not a house too large for the income derived from the estate? It has been generally thought that there was a mistake in the writing of the clause of the Act, and that instead of "not more than two rooms," it was intended to be "not less than two rooms." In Lord Cockburn's Memoirs, however, we find it stated that Charles Hope, the framer of the Act, at that time Lord Advocate, and afterwards President of the Court of Session, stated to him that he was too glad to get the Act passed with that concession to the feelings and opinions of the landed gentry in the Legislature, as some of them wanted to give less accommodation to the schoolmasters. We are glad to say that it is but seldom that the law is carried out according to the strict letter of the Act. Indeed, the feeling of the heritors now towards schoolmasters, and their opinion of the status they should hold in society, appear to be very different now from what it was at the passing of the Act, for it is seldom that any house is erected for schoolmasters with fewer than four rooms; and though the words of the Act may sometimes be used as a threat at some heritors' meetings by a parsimonious heritor, it is rarely that his opposition is so great as to compel the other heritors to erect such a small house. It is, however, advisable, yea necessary, that in any legislation about the education of the country, particular attention be paid to the accommodation for the schoolmasters.

Agricultural Statistics.—The friends and promoters of agricultural statistics have met with much discouragement during the

last quarter. The unfortunate difference between Mr Hall Maxwell and the Board of Trade has put a stop to their collection in Scotland, which was so favourably begun and heartily carried on. But however much we deplore the results of the difference, we do not see how the connection could be longer maintained between the Secretary of the Highland Society and the Board of Trade, as neither the Highland Society would allow its Secretary to be reckoned an official of Government, nor would the Board of Trade, or rather the Audit Office, relax its rules in the least regarding those who received anything having the appearance of salary from Government. We do not think that it would be possible for any independent party to collect agricultural statistical information with the same machinery as was employed by Mr Maxwell. Mr Caird's bill for the collection of agricultural statistics in England did not meet with much support in Parliament. The information required was of the simplest kind possible, and is as little as could be expected from any measure requiring a return of agricultural statistics. All that was asked for was the area under the respective crops, pastures meadows, sheepwalks, and downs. We have always said that the opposition of the English farmers to the collection of agricultural statistics was to be attributed to the nature of the tenure of land in that country. It would scarcely be expected that men who held their farms from year to year would be inclined to make similar returns to those made by Scotch farmers, more particularly as certain recent events have shown that that bond which has existed so long between landlords and tenants in England may be severed, and the tenant be compelled to leave his farm after having laid out a considerable sum of money in improving it. We see no prospect whatever now of there being any collection of agricultural statistics without a compulsory measure for both England and Scotland.

Doctoring of Cattle for Shows.—We advert to this method of preparing cattle for exhibition here, not because we have anything new to add on the subject, but to lift our voice against such a nefarious practice. We are glad to think that it is so rare—that until the exposure of it took place at the late show of the Ayrshire Society, few farmers were aware of there being any such methods for preparing cattle for exhibition. And that Society met with the cordial sympathy of every agriculturist for the spirited manner in which it took up the question, and for the summary way in which it dealt with the offender; and we trust that the law authorities will prosecute the subject farther, and inflict upon him the full penalty for his cruelty and iniquity. Anything approaching the least to dishonourable or dishonest conduct in competitions cannot be too strongly reprobated; and we trust that after this the directors of all agricultural societies will exercise a more than usual vigilance, so as not only to maintain

their honour, but to prevent uncalled-for cruelty to the animals entered for competition.

Weights and Measures.—It is evident, from the numerous meetings held everywhere to advocate a uniformity of weights and measures, and from the variety of opinions expressed, and the anxiety many members of Parliament have shown to bring in measures on the subject, that there must ere long be some extensive legislation on it. It would be well, however, before attempting any change, that the present position of the question, not only in this country, but in the other great European nations and America, be well understood. It would be highly convenient and advisable were we enabled to assimilate the weights and measures in a country with such an extensive foreign commerce as this possesses, to those of the principal kingdoms with which we carry on trade. Any paltry legislation, such as that proposed by Mr Locke this session, is to be deprecated. He merely proposed to do what has been done already—viz. to compel the sale of grain by measure. This is the law already; and we cannot see the advantage of passing a bill whose object was to legalise what is already a law that has never been repealed. It is thought by some that the introduction of Mr Locke's Act was done with the view of stealing a march on those who are opposed to the present system of selling by measure, and wish to have weight substituted for measure in the sale of grain. The passing of this Act would have left the question very much where it is. A strong feeling is growing in the country in favour of weight instead of measure; and at present we are safe in saying that the greater part of the grain is sold by weight, and the practice is being gradually adopted in towns where the sale of grain is considerable. A more extensive measure on the subject has been introduced for Ireland. It is to be regretted that the members of Parliament who have taken up the subject for legislation in the different countries should not have acted in concert, so as to introduce a general measure for the whole kingdom, or endeavoured to introduce a system which could be readily assimilated to those of other countries, so that the operations of commerce would be much facilitated.

Societies' Meetings.—Some important subjects have been discussed at different societies throughout the quarter, to which we can only allude in this place. Among the first of these we must place Dr Daubeny's lecture on Sewage, who has given it as his opinion that irrigation is the most practicable method of applying sewage; and in this he has been supported by the Commissioners appointed by Government to examine into the question. They state that it is the opinion of medical men at Milan, where there is most extensive irrigation, that the process is not injurious to health. As this has been one of the great objections to the appli-

cation of sewage to irrigation, the question may be said to be much simplified if this opinion is correct. Dr Voelcker delivered what may be called his inaugural address at one of the meetings of the Royal Agricultural Society of England, "On Agricultural Chemistry, in its Relation to the Cultivation of Root Crops." The lecture was distinguished for that clearness of diction, and contained those scientific hints in plain language, and those valuable practical suggestions, which mark all the productions of the Professor. We cannot but congratulate the Royal Agricultural Society on the judicious appointment they have made in selecting Dr Voelcker as their chemical officer. An important discussion took place at a meeting of the Highland and Agricultural Society on thrashing-machines, with special reference to the English ones. It was clearly proved during the discussion that the English machines experimented on thrashed and dressed cleaner than the Scotch ones brought into comparison with them. We trust that the Scotch machine-makers will see it their interest to bestir themselves in this matter, and prevent what will inevitably be the result, Scotch farmers ordering their machines from English makers.

Law Decisions.—M'Inroy of Lude, whose property adjoins that of the Duke of Atholl, objected to his Grace, or any of his servants, entering his grounds and driving off the deer. The Duke questioned his right to prevent him, whereupon M'Inroy applied to the Court of Session for an interdict to restrain the Duke or his servants from entering his lands and driving off the deer. The interdict was granted, on the plea that deer was neither property nor game. . . . It has been decided that the term "premises," in the Burgh Police Act, does not mean land in its agricultural state, but houses, &c.; and that, consequently, land cannot be assessed for burgh police-rates when the term "premises" is used in the Act. . . . Railway companies are found entitled, by a recent decision, to erect fences on the extreme bounds of the ground taken for the railway. . . . Two dogs strayed into a field where there were sheep, and inflicted injury on one. The shepherd on the farm, seeing them from a distance, went to them on a pony, hallooed them away, and shot them. An action of damages was brought against the master of the sheep, and of compensation against the shepherd for the two dogs. It was proved that there was no actual danger to the shepherd. The sheriff assoilzied the master, but decerned against the shepherd for £2 for each of the dogs. No order was given by the master to shoot the dogs; in fact, he was not aware of the act of his shepherd.

FIARS PRICES of the different COUNTIES of SCOTLAND, for Crop and Year 1857, by the Imperial Measure.

ABERDEEN.

	Imp. qr.
Wheat, First	38/0
—— with fodder	46/0
—— Second	30/2
—— with fodder	38/2
Barley, without fodder	27/2
—— with fodder	34/2
Bere, First, without fod.	28/
—— with fodder	35/
—— Second, without fod.	27/
—— with fodder	34/
Oats, Potato, without fod.	19/8
—— with fodder	27/8
— Common, without fod.	19/
—— with fodder	27/
Pease	30/
Beans	31/
Malt, duty included	58/
Oatmeal, per 140 lb.	15/2

ARGYLL.

Wheat	41/8
Barley	30/10
Bere	27/2
Oats	25/
Beans	43/4
Oatmeal, per 140 lb.	18/2$\frac{1}{4}$

AYR.

Wheat	43/2$\frac{1}{2}$
Barley	30/8
Bere	26/10
Oats	18/9
Pease	40/
Beans	42/
Oatmeal, per 140 lb.	16/3$\frac{1}{2}$

BANFF.

Wheat	41/10
Barley, without fodder	27/8
—— with fodder	33/8
Bere, without fodder	24/11
—— with fodder	30/11
Oats, Potato, without fod.	22/7
—— with fodder	32/7
— Common, without fod.	20/3
—— with fodder	30/3
Pease	33/2
Beans	30/6
Rye	
Oatmeal, per 140 lb.	15/

BERWICK.

Wheat	38/3$\frac{3}{12}$
Barley, Merse	27/2$\frac{4}{12}$
—— Lammermuir	23/7$\frac{10}{12}$
Oats, Merse	22/11$\frac{6}{12}$
—— Lammermuir	21/1$\frac{8}{12}$
Pease	36/0$\frac{1}{12}$
Oatmeal, per 140 lb.	20/5

BUTE.

	Imp. qr.
Wheat	40/6$\frac{10}{12}$
Barley	30/3$\frac{1}{12}$
Bere	25/
Oats	22/4$\frac{3}{12}$
Pease and Beans	
Oatmeal, per 140 lb.	17/10$\frac{6}{12}$

CAITHNESS.

Wheat	44/6
Barley, without fodder	27/10
—— with fodder	32/6
Bere	25/2$\frac{3}{4}$
Oats, Angus	19/1$\frac{3}{4}$
—— Sandy	22/
Oatmeal, per 112 lb.	16/1$\frac{1}{2}$

CLACKMANNAN.

Wheat	42/2
Barley, Kerse	26/9$\frac{2}{12}$
—— Dryfield	27/11$\frac{3}{12}$
Oats, Kerse	19/5$\frac{6}{12}$
—— Dryfield	21/6$\frac{2}{12}$
Pease and Beans	36/9$\frac{6}{12}$
Malt, duty included	60/
Oatmeal, per 140 lb.	16/6$\frac{1}{4}$

DUMBARTON.

Wheat	42/1
Barley	27/5
Bere	25/5
Oats	21/5
Pease and Beans	39/
Oatmeal, per 140 lb.	17/9

DUMFRIES.

Wheat	48/6
Barley	29/6
Bere	
Oats, Potato	21/2
—— Common	20/6
Rye	32/
Pease	32/
Beans	46/10
Malt, duty included	74/8
Oatmeal, per 140 lb.	17/3$\frac{3}{4}$

EDINBURGH.

Wheat, First	38/4
—— Second	35/6
Barley, First	27/3
—— Second	25/
—— Third	22/6
Oats, First	22/6
—— Second	20/6
Pease and Beans	37/3
Oatmeal, per 112 lb.	13/2
—— 280 lb.	32/11

ELGIN AND MORAY.

	Imp. qr.
Wheat	45/5
Barley	31/1
Oats	22/7
Rye	29/3
Pease and Beans	40/
Oatmeal, per 112 lb.	14/8

FIFE.

Wheat, White	38/0$\frac{4}{12}$
—— Red	34/9$\frac{4}{12}$
Barley	26/10
Bere	24/10
Oats	21/
Rye	25/2$\frac{8}{12}$
Pease and Beans	33/4$\frac{2}{12}$
Malt	52/
Oatmeal, per 112 lb.	13/9$\frac{8}{12}$
—— 280 lb.	34/6$\frac{2}{12}$

FORFAR.

Wheat,	38/
Barley	26/3
Bere	25/1
Oats, Potato	20/2
—— Common	19/11
Rye	25/
Pease and Beans	32/2
Oatmeal, per 140 lb.	14/10

HADDINGTON.

Wheat, First	46/10$\frac{1}{4}$
—— Second	41/0$\frac{3}{4}$
—— Third	37/2$\frac{3}{4}$
Barley, First	37/5
—— Second	32/4
—— Third	27/8$\frac{3}{4}$
Oats, First	28/5$\frac{3}{4}$
—— Second	24/9$\frac{3}{4}$
—— Third	22/5$\frac{3}{4}$
Pease and Beans, First	
—— Second	
—— Third	

INVERNESS.

Wheat, without fodder	43/6
—— with fodder	48/6
Barley, without fodder	26/3
—— with fodder	31/3
Bere, without fodder	24/3
—— with fodder	29/3
Oats, without fodder	21/10
—— with fodder	28/4
Rye, without fodder	
—— with fodder	
Pease, without fodder	40/
—— with fodder	50/
Oatmeal, per 112 lb.	15/1$\frac{1}{2}$

FIARS PRICES—*Continued.*

KINCARDINE.

	Imp. qr.
Wheat, without fodder -	37/11¼
——— with fodder -	45/5¼
Barley, without fodder -	27/9¾
——— with fodder -	33/6¾
Bere, without fodder -	27/1¾
—— with fodder - -	32/10¾
Oats, Potato, without fod.	20/7½
———— with fodder	27/4½
——Common, without fod.	19/7½
———— with fod.	26/4½
Pease, without fodder -	33/2
——— with fodder -	40/8
Beans, without fodder -	33/2
——— with fodder -	40/8
Rye, without fodder -	24/5¼
—— with fodder - -	32/5¼
Oatmeal, per 140 lb. -	15/4

KINROSS.

Wheat - - -	35/8
Barley, First - -	25/9
——— Second - -	22/9
Bere, - - -	
Oats, First - - -	21/
—— Second - -	18/
Pease - - - -	
Oatmeal, per 280 lb. -	32/

KIRKCUDBRIGHT.

Wheat - - -	47/10
Barley - - -	29/10
Oats, Potato - -	20/8
—— Common - -	19/10
Beans - - -	40/6
Oatmeal, per 140 lb. -	17/1

LANARK.

Wheat, First -	44/11$\frac{8}{12}$
——— Second -	41/1
Barley, First -	26/11$\frac{8}{12}$
——— Second -	26/8
Bere, First -	23/5$\frac{8}{12}$
—— Second -	
Oats, First - -	22/6$\frac{6}{12}$
—— Second -	19/3¼$\frac{9}{12}$
—— Third - -	17/10$\frac{9}{12}$
Pease, First - -	
——— Second -	
Beans, First - -	39/5¼$\frac{9}{12}$
——— Second -	
Malt - - -	50/11$\frac{4}{12}$
Oatmeal, First, per 140 lb.	16/10½
——— Second, do.	15/9

LINLITHGOW.

Wheat - - - -	38/9
Barley - - - -	29/5
Oats - - - -	22/
Pease and Beans -	37/3
Malt - - - -	52/
Oatmeal, per 112 lb. -	14/
———— 140 lb. -	17/1

NAIRN.

	Imp. qr.
Wheat - - - -	44/6
Barley, without fodder	26/
——— with fodder -	32/6
Oats, without fodder -	22/
——— with fodder -	30/6
Oatmeal, per 112 lb. -	15/

ORKNEY.

Bere, per 368 lb. - -	19/1
Malt, per 140 lb. - -	15/1
—— with duty - -	23/6
Oatmeal, per 140 lb. -	14/3

PEEBLES.

Wheat, First - -	42/4¾
——— Second - -	41/4½
——— Third - -	40/
Barley, First - -	32/8¾
——— Second - -	28/11½
——— Third - -	25/7
Oats, First - - -	22/3¾
—— Second - - -	20/9½
—— Third - - -	19/9¼
Pease and Beans, First	42/6¾
———— Second	41/3½
———— Third	40/7¼
Oatmeal, First, per 140 lb.	16/7½
——— Second ———	16/3
——— Third ———	15/8¼

PERTH.

Wheat, First - -	39/5
——— Second - -	34/2
Barley, First - -	27/2
——— Second - -	23/6
Oats, First - - -	20/5
——— Second - -	18/6
Rye - - - -	27/10
Pease and Beans - -	34/10
Oatmeal, per 140 lb. -	16/10

RENFREW.

Wheat, First - -	45/8¾
——— Second - -	45/
Barley, First - -	30/11½
——— Second - -	29/7¾
Bere, First - -	29/3½
—— Second - -	29/2
Oats, First - - -	23/0½
—— Second - - -	21/8½
Beans, First - - -	42/4¾
——— Second - -	40/10½
Oatmeal, First, per 140 lb.	18/
——— Second ———	17/10½

ROSS AND CROMARTY.

	Imp. qr.
Wheat, First - -	40/10½
——— Second - -	33/1½
Barley - - - -	26/4
Bere - - - -	27/4
Oats, First - - -	22/6½
——— Second - -	22/4½
Pease - - - -	
Beans - - - -	
Rye - - - -	35/6
Malt - - - -	51/5
Oatmeal, per 140 lb. -	19/3
Barley-meal - -	15/

ROXBURGH.

Wheat - - -	37/10¼¾
Barley - - -	28/7$\frac{1}{12}$
Oats - - -	23/4$\frac{1}{12}$
Rye - - -	
Pease - - -	40/8$\frac{1}{12}$
Beans - - -	37/3$\frac{1}{12}$
Oatmeal, per 140 lb.	16/6

SELKIRK.

Wheat - - -	38/
Barley - - -	27/3
Oats, Potato - - -	21/
—— Common - -	20/7
Pease - - - -	40/
Oatmeal, per 280 lb. -	31/6

STIRLING.

Wheat - - - - -	39/7½
Barley, Kerse - -	26/10
——— Dryfield - -	26/5
Oats, Kerse - -	21/1
—— Dryfield - -	21/5
—— Muirland - -	17/4
Beans - - - -	37/4
Malt - - - -	54/6
Oatmeal, per 140 lb. -	16/7

SUTHERLAND.

Wheat - - - -	44/6
Barley - - - -	29/3
Bere - - - -	26/
Oats - - - -	24/
Rye - - - -	
Pease - - - -	
Oatmeal, per 140 lb. -	19/9

WIGTOWN.

Wheat - - - -	41/6
Barley - - - -	32/10
Bere - - - -	27/8
Oats, Potato - -	20/6
—— Common - -	18/10
Rye - - - -	32/4
Pease - - - -	
Beans - - - -	38/
Malt - - - -	
Oatmeal, per 280 lb. -	33/10

WE may inform our English readers, that Fiars Prices are the average prices of grain, as ascertained every year, by the verdict of Juries, in every County of Scotland. The Juries are summoned in spring, and ascertain, from the evidence produced to them, the average prices of the preceding crop. By these prices, rents payable in grain, and similar contracts, are generally determined; but the main object is to convert into money the stipends (for the most part fixed at a certain quantity of grain) of the Scottish Clergy.

AVERAGE PRICE OF THE DIFFERENT KINDS OF GRAIN,

PER IMPERIAL QUARTER, SOLD AT THE FOLLOWING PLACES.

LONDON.

Date.	Wheat.	Barley.	Oats.	Rye.	Pease.	Beans.
1858.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Feb. 6.	50 3	37 11	25 1	33 0	42 5	36 10
13.	48 4	37 0	25 2	32 6	46 3	36 8
20.	46 10	38 5	23 5	32 2	42 6	34 6
27.	47 6	38 10	23 1	31 9	42 1	36 0
Mar. 6.	47 3	37 6	24 4	30 6	41 2	34 2
13.	47 7	40 5	24 9	28 0	40 10	34 10
20.	48 3	35 10	23 9	29 4	41 3	36 2
27.	47 8	39 2	22 11	29 6	42 6	34 10
April 3.	46 11	38 7	23 7	28 0	42 7	36 1
10.	46 8	31 4	26 6	28 8	41 6	35 7
17.	45 11	40 11	26 9	29 11	42 1	36 11
24.	47 8	39 8	27 6	29 0	43 6	36 8
May 1.	47 3	40 3	29 3	29 6	43 7	37 5
8.	46 11	37 2	26 5	30 6	45 2	36 6
15.	47 11	35 10	25 9	31 2	47 1	37 6
22.	47 4	35 0	26 0	30 8	37 7	28 6
29.	47 8	35 10	29 8	30 0	43 2	36 4

EDINBURGH.

Date.	Wheat.	Barley.	Oats.	Pease.	Beans.
1858.	s. d.	s. d.	s. d.	s. d.	s. d.
Feb. 3.	39 7	28 7	23 3	37 6	37 11
10.	39 10	27 9	24 7	36 10	37 6
17.	39 9	28 1	24 10	37 9	38 6
24.	40 4	29 6	25 7	37 6	38 3
Mar. 3.	40 2	30 1	26 6	37 10	38 6
10.	40 1	30 9	26 10	38 10	39 6
17.	41 4	30 11	27 5	39 8	40 10
24.	41 1	32 8	28 3	42 6	43 5
31.	41 1	32 2	28 6	42 9	43 10
April 7.	41 7	33 4	27 11	42 1	42 9
14.	43 5	34 2	28 1	42 4	43 6
21.	41 9	34 5	28 2	43 4	43 10
28.	42 5	34 4	28 6	41 8	42 2
May 5.	43 4	34 10	28 7	41 6	42 1
12.	41 0	28 1	27 11	40 10	41 10
19.	42 1	34 5	28 8	41 4	42 3
26.	41 1	31 5	27 8	42 6	43 2

LIVERPOOL.

Date.	Wheat.	Barley.	Oats.	Rye.	Pease.	Beans.
1858.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Feb. 6.	46 10	30 5	21 6	26 9	40 10	36 7
13.	46 11	30 0	22 3	27 9	41 5	41 10
20.	45 9	30 1	22 8	28 10	43 10	40 7
27.	46 3	29 2	21 9	29 4	42 6	40 4
Mar. 6.	46 0	34 5	24 8	30 6	42 1	39 9
13.	46 6	34 8	21 5	29 5	40 6	43 1
20.	46 8	34 8	23 6	29 2	40 8	41 6
27.	45 4	33 6	24 10	28 8	40 2	40 10
April 3.	45 9	33 10	22 4	28 2	40 9	39 8
10.	46 9	32 8	25 1	27 10	41 2	41 4
17.	46 1	31 9	25 6	28 9	40 1	42 2
24.	47 6	29 5	22 10	28 4	39 10	43 2
May 1.	46 7	28 7	25 11	27 9	40 3	42 0
8.	46 4	30 1	25 0	29 6	40 6	43 8
15.	45 7	32 4	26 0	30 6	41 2	42 10
22.	46 6	33 2	26 9	32 10	41 6	44 3
29.	45 3	32 2	26 8	32 4	42 1	44 2

DUBLIN.

Date.	Wheat, p. barl. 20 st.	Barley, p. barl. 16 st.	Bere, p. barl. 17 st.	Oats, p. barl. 14 st.	Flour, p. barl. 9 st.
1858.	s. d.	s. d.	s. d.	s. d.	s. d.
Feb. 5.	26 0	16 7	13 9	12 0	18 6
12.	26 4	16 5	13 10	12 2	18 7
19.	26 2	15 2	13 6	12 11	18 5
26.	26 0	15 3	13 2	13 0	18 4
Mar. 5.	26 6	16 1	13 9	13 2	18 3
12.	26 5	16 2	13 7	13 1	18 2
19.	26 1	16 10	13 4	12 10	18 3
26.	26 3	16 1	13 10	13 0	18 4
April 2.	26 6	16 9	14 1	13 2	18 3
9.	25 6	17 1	14 6	15 9	18 2
16.	26 8	17 6	15 1	15 5	18 4
23.	26 6	17 4	14 9	15 2	18 4
30.	26 2	16 11	14 6	15 4	18 5
May 7.	26 5	16 9	14 6	15 6	18 4
14.	26 6	16 5	14 2	16 1	18 3
21.	27 0	16 7	14 5	16 4	18 4
28	27 2	16 8	14 1	16 2	18 0

TABLE SHOWING THE WEEKLY AVERAGE PRICE OF GRAIN,

Made up in terms of 7th and 8th Geo. IV., c. 58, and 9th and 10th Vict., c. 22. On and after 1st February 1849, the Duty payable on FOREIGN CORN imported is 1s. per quarter, and on Flour or Meal 4½d. for every cwt.

Date.	Wheat.		Barley.		Oats.		Rye.		Pease.		Beans.	
	Weekly Average.	Aggregate Average.	Weekly Average.	Aggregate Average.	Weekly Average.	Aggregate Average.	Weekly Average.	Aggregate Average.	Weekly Average.	Aggregate Average.	Weekly Average.	Aggregate Average.
1858.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Feb. 6.	46 9	47 10	36 8	36 9	23 0	22 7	31 2	32 10	41 0	40 1	38 11	39 3
13.	45 8	47 7	36 3	36 10	22 8	22 8	30 9	32 8	41 1	40 4	39 3	39 3
20.	44 6	47 0	35 9	36 8	22 10	22 8	34 3	32 9	40 2	40 4	38 2	39 1
27.	45 0	46 4	35 11	36 6	22 4	22 9	35 0	33 0	40 6	40 5	38 4	38 11
Mar. 6.	45 6	45 10	36 7	36 4	23 4	22 11	34 0	33 4	41 0	40 8	37 11	38 8
13.	45 3	45 5	36 6	36 3	23 3	22 11	31 3	32 9	41 2	40 10	37 11	38 5
20.	45 6	45 3	36 8	36 4	23 4	23 0	31 9	32 10	41 0	40 10	37 10	38 3
27.	45 2	45 2	37 3	36 9	23 5	23 1	29 11	32 8	41 5	40 11	38 1	38 1
April 3.	44 3	45 1	36 10	36 8	23 5	23 2	31 3	32 9	41 9	41 2	38 4	38 2
10.	43 1	44 9	36 3	36 8	24 1	23 6	30 9	31 6	41 1	41 3	38 6	38 1
17.	43 2	44 5	36 7	36 8	24 7	23 8	30 4	30 10	41 5	41 4	38 10	38 3
24.	44 9	44 4	36 5	36 8	24 9	23 11	33 3	31 2	41 6	41 4	39 9	38 7
May 1.	44 5	44 2	36 1	36 7	25 4	24 3	28 1	30 7	42 4	41 7	40 3	39 0
8.	44 2	44 0	35 5	36 3	25 7	24 8	30 10	30 9	42 2	41 9	40 9	39 5
15.	44 11	44 1	35 0	36 0	25 8	25 0	35 7	31 6	42 1	41 9	40 9	39 10
22.	44 6	44 4	34 9	35 9	26 1	25 4	32 8	31 9	42 7	42 0	41 6	40 4
29.	44 8	44 7	34 3	35 4	26 2	25 7	33 9	32 4	42 8	42 3	41 8	40 10

FOREIGN MARKETS.—Per Imperial Quarter, free on board.

Date.	Markets.	Wheat.	Barley.	Oats.	Rye.	Pease.	Beans.
1858.		s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.
Feb. ..	Danzig	36 0 - 43 6	20 6 - 28 0	15 0 - 23 6	26 6 - 31 6	28 6 - 33 6	30 6 - 36 [illegible]
Mar. ..	Danzig	38 6 - 44 6	21 6 - 28 6	16 6 - 24 6	28 6 - 33 0	29 6 - 35 0	31 6 - 37 [illegible]
April ..	Danzig	39 0 - 45 0	22 6 - 29 6	17 6 - 25 6	28 6 - 32 6	30 0 - 36 0	33 6 - 38 [illegible]
May ..	Danzig	37 6 - 43 0	22 0 - 29 0	17 0 - 25 0	22 6 - 25 0	32 6 - 47 0	34 0 - 39 [illegible]
Feb. ..	Hamburg	36 6 - 46 6	22 6 - 28 6	16 6 - 25 0	23 6 - 31 6	28 6 - 35 6	27 6 - 36 [illegible]
Mar. ..	Hamburg	35 6 - 44 0	24 6 - 32 6	15 6 - 21 6	25 6 - 33 0	29 6 - 36 6	29 6 - 38 [illegible]
April ..	Hamburg	36 6 - 44 6	26 6 - 33 6	15 6 - 22 0	27 6 - 34 0	31 6 - 36 6	28 6 - 39 [illegible]
May ..	Hamburg	37 6 - 44 9	23 6 - 28 3	16 0 - 24 0	24 6 - 31 0	32 0 - 40 0	29 0 - 38 [illegible]
Feb. ..	Bremen	36 6 - 46 0	23 6 - 28 0	15 6 - 22 6	24 0 - 32 6	28 6 - 34 6	28 0 - 34 [illegible]
Mar. ..	Bremen	37 6 - 47 6	24 6 - 31 6	16 6 - 24 0	24 6 - 33 0	30 6 - 37 6	30 6 - 36 [illegible]
April ..	Bremen	36 6 - 46 6	25 6 - 32 0	18 6 - 25 0	25 6 - 33 0	33 0 - 40 6	30 0 - 35 [illegible]
May ..	Bremen	35 6 - 46 0	26 6 - 33 0	18 0 - 24 6	25 0 - 32 6	34 6 - 42 0	32 6 - 37 [illegible]
Feb. ..	Königsberg	34 6 - 44 6	22 0 - 27 6	15 0 - 23 0	23 6 - 31 6	35 6 - 46 6	30 0 - 36 [illegible]
Mar. ..	Königsberg	36 6 - 46 6	24 0 - 30 6	14 6 - 18 6	25 6 - 33 0	36 0 - 48 0	32 0 - 37 [illegible]
April ..	Königsberg	37 6 - 47 0	24 6 - 31 0	16 6 - 25 0	26 0 - 34 6	35 6 - 47 0	32 6 - 37 [illegible]
May ..	Königsberg	36 6 - 46 0	25 6 - 31 6	17 6 - 25 6	24 6 - 32 0	32 6 - 45 0	34 6 - 38 [illegible]

Freights from the Baltic, from 2s. 6d. to 5s.; from the Mediterranean, 8s. 6d. to 10s. 6d.; and by steamer from Hamburg, 2s. 6d. to 4s. 6d. per imperial qr.

THE REVENUE.—From 1st January to 31st March 1858.

	Quarters ending Mar. 31. 1857.	Quarters ending Mar. 31. 1858.	Increase.	Decrease.	Years ending Mar. 31. 1857.	Years ending Mar. 31. 1858.	Increase.	Decrease.
	£	£	£	£	£	£	£	£
Customs	5,243,600	5,888,352	644,752	..	23,321,843	23,109,104	..	212,7[illegible]
Excise	2,898,000	3,251,000	353,000	..	18,165,000	17,825,000	..	340,0[illegible]
Stamps	1,905,477	2,051,973	146,496	..	7,372,209	7,415,719	43,510	..
Taxes	260,020	308,033	48,013	..	3,116,046	3,152,033	35,987	..
Post-Office ..	777,000	705,000	..	72,000	2,886,000	2,920,000	34,000	..
Miscellaneous	492,569	415,360	..	77,209	1,383,030	1,873,541	490,511	..
Property-Tax	6,942,483	3,390,601	..	3,551,882	16,086,934	11,586,115	..	4,503,8[illegible]
Total Income	18,519,149	16,010,319	1,192,261	3,701,091	72,334,062	67,881,512	604,008	5,056,5[illegible]
	Deduct increase....			1,192,261	Deduct increase....			604,00[illegible]
	Decrease on the qr.			2,508,830	Decrease on the year			4,452,5[illegible]

PRICES OF BUTCHER-MEAT.—Per Stone of 14 Pounds.

Date.	London Beef.	London Mutton.	Liverpool Beef.	Liverpool Mutton.	Newcastle Beef.	Newcastle Mutton.	Edinburgh Beef.	Edinburgh Mutton.	Glasgow Beef.	Glasgow Mutton.
1858.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.
Feb. ..	6 0 - 8 3	6 6 - 9 0	6 6 - 7 6	6 9 - 8 3	6 9 - 7 6	7 3 - 8 9	5 9 - 7 3	6 3 - 8 0	6 3 - 7 9	6 6 - 8 [illegible]
Mar. ..	6 0 - 7 9	6 9 - 9 0	6 0 - 7 3	6 6 - 8 0	5 9 - 7 3	6 9 - 8 3	5 6 - 7 0	6 0 - 7 6	6 0 - 7 6	6 3 - 7 [illegible]
April ..	5 9 - 7 0	6 6 - 8 6	5 9 - 7 0	6 0 - 7 6	5 9 - 7 3	6 6 - 8 3	5 9 - 7 3	6 0 - 7 6	6 0 - 7 9	6 6 - 8 [illegible]
May ..	5 9 - 7 3	6 9 - 8 9	6 0 - 7 3	6 3 - 7 9	6 0 - 7 6	6 6 - 8 0	6 0 - 7 6	6 3 - 8 0	6 3 - 8 0	6 9 - 8 [illegible]

PRICES OF ENGLISH AND SCOTCH WOOLS.—Per Stone of 14 Pounds.

ENGLISH.	s. d.		s. d.	SCOTCH.	s. d.		s. d.
Merino,	18 6	to	24 0	Leicester Hogg,	18 0	,,	22 6
.. in grease,	15 6	,,	20 0	.. Ewe and Hogg,	14 0	,,	18 6
South-Down,	18 6	,,	24 0	Cheviot, white,	13 6	,,	17 6
Half-Bred,	14 0	,,	20 0	.. laid, washed,	8 6	,,	12 6
Leicester Hogg,	16 6	,,	23 0	.. .. unwashed,	7 0	,,	10 6
.. Ewe and Hogg,	14 6	,,	20 0	Moor, white,	7 0	,,	10 0
Locks,	9 0	,,	11 6	.. laid, washed,	6 0	,,	8 0
Moor,	6 0	,,	8 0	.. .. unwashed,	5 6	,,	6 6

NOTES ON NOVELTIES AT THE NATIONAL AGRICULTURAL SHOWS OF 1858.—CHESTER (JULY); ABERDEEN (SEPTEMBER).

By ROBERT SCOTT BURN.

THE CHESTER MEETING OF THE ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

"ENGLAND," some one has finely said, "has gone to and fro upon the earth, and her sounding steps have been those of a giant. Her morning drum beat, following the sun, and keeping pace with the circling hours, compasses the earth daily, with one continuous and unbroken strain of her martial airs." Among the potent influences which have raised our country to this exalted state, and given her a dominion on which the sun never sets, that of STEAM must be reckoned as the chief. Yoked to the whirling engine, called into existence by the genius of Watt, it furnished us with an agent panoplied in power, which enabled us to cope successfully with difficulties almost unparalleled in the history of any nation, when we stood nearly alone, the world in arms against us. With a curious adaptation to its circumstances of action, it enabled us to dig deep the mine, from whence was gathered the fuel to supply its wants, augment its power, and widen its sphere of usefulness. Its giant might, applied to aid our manufactures, rapidly changed the whole aspect of the system, and effected wonders, more startling and striking far than the fables of old display. As at the waving of the enchanter's wand, rough places are made plain, crooked places straight, and the dreariness of the desert beautified by the fairness of the flower; so, at the bidding of the power of steam, difficulties which erst had conquered man, quickly vanished; and as men stooped to do his bidding, in sylvan scenes sprang up the crowded streets and dingy alleys; for the quiet hum of the country was heard the clash of wheels and levers; green fields, on which the dewdrops rested, were trodden down by the tramp of a busy population; and bright skies, in which the lark sung flutteringly, were darkened by the smoke-clouds from a hundred chimneys. Wealth was scattered broadcast over the land; men who yesterday were "but lords of their presence, and no lands beside," to-morrow the possessors of broad acres, and the dwellers in lordly halls. Fleets were called into existence to bear the treasures of our looms to distant lands, and steam—ever expansive in its power—lent to them a quicker speed, and gave to them a mastery over the winds and waves of ocean; while the cars, laden with the labours of the mill and the factory, were propelled almost at lightning speed along the iron ways. Town became linked to town, "united in iron bands."

At first these marvels were displayed chiefly in aid of "cotton and commerce," those idols of a certain school of political economists, as the almighty dollar is of the cute Yankee and the unscrupulous "Down-Easter;" and for some time agriculture, considered by the same school of political economists to be a thing of the past, had evidently no interest in the power of the future. She was left to languish in her half-neglected fields; and to the eye of the superficial observer, gave no sign that she was stirred to new life and more vigorous action by the power that inspired other callings, and led them quickly on in the paths of progress. But though slowly, not less surely was the new power influencing agriculture. The very nature of her operations necessitates slow progress in their improvement. In other callings experiments can be made from day to day; the faults and omissions of to-day obviated and repaired to-morrow; but in many of the operations of agriculture, trial-time comes but once a-year, and then not seldom in very inauspicious guise. Far-seeing men, interested in her progress, looked forward to the time when the power of steam would bring about wonders in connection with agriculture, as striking and as beneficial in its results as it had done in connection with manufactures and commerce. In their endeavour to carry out the projects which had the realisation of this aid in view, men began to work quietly and steadily; and though to many of them the field of labour was a fruitless one, yet nevertheless they worked on in the fulness of faith, and the power of patience and perseverance. Nor "did they cast their bread upon the waters" vainly. In process of time it returned in good measure—if not to them, to their neighbours at least. Interest began to be excited in what the new power could effect for agriculture. Evidences of its might began to multiply in remote districts, and at quiet farm-steadings. Engines filled with their portly presence the yards of agricultural shows, and took positions as things useful in everyday life, and not merely as "schemes" of Utopian dreamers. With every step in advance, and every addition to the evidence as to how much it could do, the idea bulked more largely in the progressive mind that it could do more; and as it showed its powers and capabilities in the steading, at the thrashing-mill, the straw or the turnip-cutter, so might it—and so could it, said many, albeit then sneered at—be as powerful and capable of work in the field, and amongst the corn. This idea grew apace, and thrived wonderfully, till men began to see it as a not unlikely thing, that it would soon be realised in practice.

"The saying that the world must end in smoke,
Seems true in these last days of *steam* and coke,
When the loud engine on the iron rails,
O'er ancient ties and sympathies prevails." *

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* From the German of *Ludwig I., King of Bavaria.* By J. Gostick.

If this be true, men will wake some of these fine days to find it no less true, that over as ancient ties and powerful sympathies, steam, in connection with agriculture, will prevail too. Already have the stolid indifference of the "slow" farmer, satisfied with the present, and having no hope in the future, and the soft sentimentality of the Cit, received their death-blow. Even now, in some fields, we hear the snort of the steam-engine dragging the plough, ere long to be multiplied, till over a hundred fields shall hang the smoke or the steam-cloud, and the scream of the steam-whistle drown the song of the lark, or the cry of the corn-crake.

Powerful among the influences which will tend speedily to realise this ideal state of matters, must be ranked the results of the Chester Show. With its happy exemplifications of what the steam-engine can do for the farmer, in thrashing his grain—in preparing it for market, in crushing the corn, cutting the fodder, pulping the turnip, or, above all, dragging the plough—the Chester Show may be said to be the apotheosis of steam as applied to agriculture. It was *the* grand feature of the great gathering of the votaries of Ceres. Before it all other points of interest "paled their ineffectual fires." It has not only afforded an opportunity to show what steam has done for agriculture, but it has yielded unmistakable evidence of the much greater things that it can yet do. It has pointed out fairly and fully the direction in which future efforts must be made, if rapid progress in the future is desiderated. It was the inauguration of a new era, bright with the hopes of difficulties encountered but to be overcome; of a time fast approaching when the desert shall be made glad—when dull places, sad and sterile now, shall be bright with the trophies of peaceful and lightened labour—when great tracts shall be wrested from ocean's hands, and instead of waving seaweed or marshy plant, be made to yield to the sounding scythe, or the rapid reaper, shocks of the smiling corn—when the marsh shall be freed from its stagnant waters, and the black moss made green with verdure—when the valleys on the hill-sides shall bear their burden for the food of man, and the very hill-tops—as prophesied in Holy Writ—shall be covered with a golden diadem, waving to the winds that sweep their sides.

In our article on the Shows of 1857 in this Journal, we took occasion to advert to the steady progress of the Royal Agricultural Society's Shows, and of the interest excited by them amongst manufacturers of agricultural machinery, as evidenced in the yearly increasing lists of exhibitors, and of the number of the implements exhibited by them. As the Salisbury Show of last year exceeded all previous in variety of interest and extent of machines exhibited, so that of Chester has exceeded Salisbury. It will be interesting to tabulate the gradual progress of the Shows, thus :—

Year.	Place.	Number of Entries of Implements.
1839	Oxford	23
1840	Cambridge	36
1841	Liverpool	312
1842	Bristol	455
1843	Derby	508
1844	Southampton	948
1845	Shrewsbury	942
1846	Newcastle	735
1847	Northampton	1321
1848	York	1508
1849	Norwich	1882
1850	Exeter	1223
1851	Windsor	Implements exhibited at the Crystal Palace Great Exhibition.
1852	Lewes	1722
1853	Gloucester	1802
1854	Lincoln	861
1855	Carlisle	621
1856	Chelmsford	1072
1857	Salisbury	981
1858	Chester	3288

Of this great gathering at Chester, which has shot so far ahead of its predecessor, the chief feature was the trial of steam-cultivators, for the best of which a prize of £500 was offered. We, last year, in noticing the efforts which had been made at Salisbury to practically realise steam culture, had occasion to regret that the results of the trials were more calculated to retard than to aid the progress of the movement; to discourage rather than promote hope amongst those who expressed an interest in it. This year we have more grateful facts to record. The indecision—shall we say the bungling?—exhibited at Salisbury, gave place at Chester to decision of movement on the part of all concerned, judges as well as exhibitors, and to a business-like mode of procedure; all of which resulted in establishing steam cultivation as a great fact—a thing accomplished, and capable of vastly increasing the working resources of agriculture. The failure at Salisbury may now be looked upon as one of those unfortunate "hitches" which, in their progress towards perfection, all inventions experience, but which has been amply compensated for by the fortunate termination of the Chester trials. As to the practical nature of the results, there is but one opinion.

We had prepared a series of illustrations and descriptions of the mechanism entered for trial in competition for this great prize; but from the length to which these extended, we have deemed it best, in order to do justice to the subject, to defer their appearance till the next Number, rather than give a meagre abstract of results in this. In like manner, and for the same reasons, we transfer our remarks upon the trials, and their results, of the steam-engines and [illegible] ashing-machines, turnip-cutters, and other machines worked [illegible]-power. We have space, however, to give a list of prizes, [illegible] names of those fortunate enough to obtain them.

Implement.	Maker.	Value of Prize.
Steam-Cultivator, that shall, in the most efficient manner, turn over the soil, and be an economical substitute for the plough or spade,	John Fowler, C.E., 28 Cornhill, London,	£500.*
Portable Steam-Engine, above 8, and not exceeding 12 horse-power,	R. Hornsby and Sons, Grantham,	£25. 1st prize.
Portable Steam-Engine, not exceeding 8 horse-power,	Tuxford and Sons, Boston,	£25. 1st prize.
Second best do.,	Clayton and Shuttleworth, Lincoln.	£10. 2d prize.
Fixed Steam-Engine, not exceeding 10 horse-power,	Barrett, Exall, and Andrews, Reading,	£20. 1st prize.
Second best ditto,	R. Hornsby and Sons, Grantham,	£10. 2d prize.
Boiler for a fixed engine not exceeding 10 horse-power,	Ransome and Sims, Ipswich,	£10.
Portable Trenching-Machine, to be worked by horse power not exceeding that of 6 horse,	Richard Garrett and Sons, Saxmundham, Suffolk,	£10.
Portable Thrashing-Machine, not exceeding 8 horse-power, for large scarifications, to be worked by steam-power,	Clayton and Shuttleworth, Lincoln,	£15.
Portable Thrashing-Machine that will best prepare the corn for the finishing dressing-machine, not exceeding 8 horse-power,	Do.	£15.
Portable *Combined* Thrashing-Machine, that will best prepare the corn for market, not exceeding 8 horse-power,	Do.	£15.
Fixed Combined Steam Thrashing-Machine for preparing corn for market, not exceeding 10 horse-power,	R. Hornsby and Sons, Grantham,	£20.
Fixed Combined Steam Thrashing-Machine for preparing corn for market, not exceeding 8 horse-power,	Clayton and Shuttleworth, Lincoln,	£10.
Corn-Dressing Machine,	R. Hornsby and Sons,	£5.
Corn-Dressing Machine for preparing corn for market, after being riddled and screened,	R. Garrett and Sons, Saxmundham,	£5.
Screen for Corn,	Robert Roby, Lincoln,	£3.
Screen for Seeds,	No competition for this prize,	£3.
Chaff-Cutter for horse or steam power,	James Cowes, Burbridge Nantwich,	£5. 1st prize.
Do. do. do.	Bernhard Samuelson, Banbury,	£3. 2d prize.
Chaff-Cutter for hand power,	Ransome and Sims,	£3. 1st prize.
Do. do.	Richmond and Chandler, Salford, Manchester,	£2. 2d prize.
Grinding Mill with steel or stone grinders for grinding agricultural produce into meal, to be worked by horse or steam power,	R. Garrett and Sons,	£10.

* In connection with the trials for this prize, we may here note, that the judges deemed a "gold medal of honour" worthy of presentation to Messrs Howard, "for the practical introduction of Smith's application of steam-power to facilitate autumnal cultivation, now generally admitted to be desirable on all descriptions of soils."

Implements.	Maker.	Value of Prize.
Linseed or Corn-Crusher,	Ransome and Sims,	£5.
Oilcake Breaker,	E. H. Bentull, Heybridge, Malden,	£5.
Oilcake Breaker for common cake,	W. N. Nicholson, Newark-upon-Trent,	£3.
Bone Mill, to be worked by steam or other power,	Alfred Croskill, Beverley,	£10.
Bone-Dust Mill,	Do. Do.	£5.
Turnip Cutter,	Ransome and Sims,	£3.
Turnip Cutter for hand power,	B. Samuelson,	£3.
Root Pulper,	E. H. Bentall,	£3.
Churn,	Burgess and Kay, Newgate Street, London,	£3.
Cheese Press,	H. Carson, Warminster, Wilts,	£3.

To the following were awarded Silver Medals :—

William Woolfe, Regent Street, Gloucester, for a Paring Plough.
R. and J. Reeves, Bratton, Westbury, for Cheese-making Apparatus.
Priest and Woolnagh, Kingston-on-Thames, Surrey, for a Rowley's Blast Drill for destroying the Fly in Turnips.
E. Page and Co., Bedford, for a Tile Machine.
Burgess and Kay, Newgate Street, London, for a Chronometrical Chronometer.
George Turner, 196 Great Dover Street, Borough, London, for a Whisk for Eggs.

We are now prepared to glance briefly at the miscellaneous novelties of the Show-yard.

In the department of cultural implements we have to notice the paring-plough invented by Mr Woolfe, Gloucester, and for which a silver medal was awarded. In this implement, the beam in front of the share is widened out to give space for the working of a horizontal shaft which carries a three-bladed knife. The blades of this knife are horizontal, and so fixed in the shaft, that as they revolve, they come in contact with the slice or paring of turf which is being raised by the shares, and partially divide it, or sever it into lengths. The slice is only partially cut, that it may be easily laid over. The shaft and knife receive motion coincident with that of the forward motion of the plough, by means of a vertical disc-wheel, with a cutting edge keyed on the shaft outside the beam. This, as it cuts into the turf, &c., to be pared on the land side of the plough, acts as a revolving cutter, and receives a rotatory motion which is imparted to the shaft with its cutting blades. This implement was highly commended by the judges, and is favourably spoken of by practical men who have tested its working capabilities.

In the department of machines connected with the cultivation of the soil, Messrs Robert and John Reeves of Bratton, Westbury, Wilts, exhibited their patent Dry Manure-Distributor, capable of distributing guano, soot, or any artificial manure, with great regularity, in quantity varying from 4 to 100 bushels per acre. It may also be used as a broadcast machine for corn. The manure to be

distributed is placed in a box, the length of which is equal to the breadth of ground proposed to be covered by the machine. This box is narrow at the bottom, and made curved, instead of square. A number of openings are made at one side of the box, by which the manure is discharged. The quantity passing from the box through these openings, is regulated by a slide curved to fit the outline of the manure-box, and which is continued along the whole length of the box. At each extremity of the slide a curved rack is placed, into which a small pinion takes; this pinion is fixed on a shaft extending across the machine, and which is actuated by a hand-lever. The slide being curved to the same outline as that of the manure-box, and being opposite the holes by which the manure is discharged, is by means of the rack and pinion moved up and down, so as to open or shut the manure apertures as desired. Thus, suppose the lower edge of slide to be coincident with the upper edge of the apertures in the manure-box, the apertures will be fully open; but by bringing down the hand-lever of the pinion-shaft, the rack of the slide is depressed, and gradually covers the apertures in the box. When the dry manure-box is used in conjunction with the corn-drill, a funnel is hung opposite to each aperture, which leads the manure to the ground to be deposited in the line made by the coulter.

In the lower part of the manure-box, a shaft revolves; on this, a series of inclined blades are mounted; these project from each extremity of the two opposite diameters, but they are inclined in different directions, two being in one, and two in the opposite direction. As the shaft revolves, the blades, working nearly in contact with the line of apertures, keep the manure in a state of continual agitation—worked backwards to and fro, till it escapes from the box through the apertures. Cost, £10.

The same firm exhibit a patent hand-drill for corn and seeds. It is capable of dropping in bunches, or sowing in line, onions, carrots, peas, beans, &c. As it can drop two or three grains of wheat, &c., at intervals, it is useful as a dibble. In this apparatus, the seed-chamber is formed of a vertical cylinder, some 3 or 4 inches in diameter, and 6 in height. It is placed in front of the framework of the machine, and its lower extremity is brought as near to the ground as possible, to prevent the action of the wind on the seeds as they drop into the furrow, which is formed by a coulter which precedes the seed-chamber. In the lower part of the chamber a plate is fixed, in which a series of perforations are made, the seed passing through these to the furrow. Above this plate a circular plate is made to revolve, the axis or spindle of this being actuated by bevel-gearing deriving motion from the axle of the two driving or running wheels of the apparatus. This revolving plate is provided with a series of apertures. As the apertures in the lower fixed and

upper revolving plates coincide, or are opposite to each other, the seeds deposited in the chamber are allowed to pass through to the furrow; but while the solid parts of the one plate are opposite the apertures of the other, no seed is allowed to pass. By having a series of change plates with a different number of holes in each, the intervals in the quantity distributed can be regulated as desired. The price of the machine is £3, 10s.

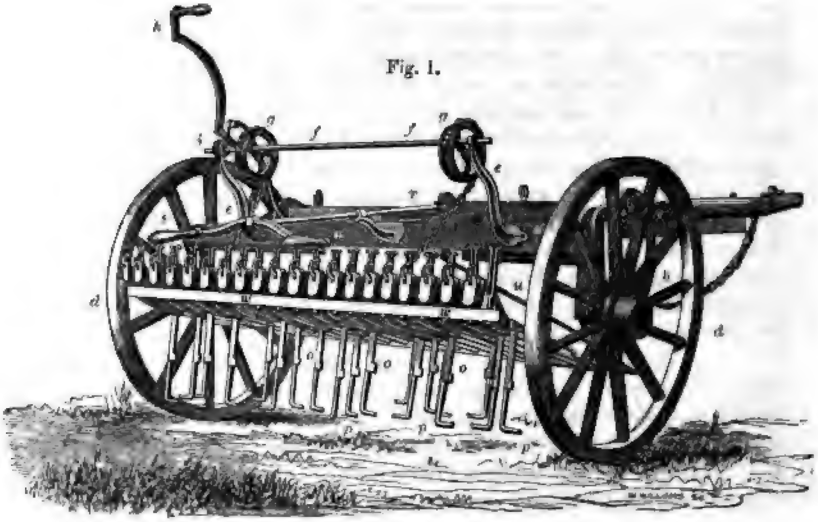
Mr Cambridge exhibited his new "Clod-crusher" and his "Chain-harrows." In the clod-crusher, he effects a combination of the "Press-wheel roller" and the clod-crusher, by placing between each pair of his well-known "press wheel-rollers," a wheel with a serrated or notched periphery. The improvements in the chain-harrows have reference to obviating the faults attendant upon the operation of these implements of this class generally in use. In the old form of chain-harrows, the employment of the transverse bar which keeps the chains apart, gives such rigidity to the assemblage, that the links do not adapt themselves to the inequalities of the land operated upon. The patentee obviates this by employing a flexible bar jointed in two or more lengths, each consisting of several links formed in one piece, and coupled together by joints. The links composing the harrow are so arranged, that one row will work *between* the lines formed by the row preceding.

Messrs Priest and Woolnagh exhibited a Blast-drill—for which a silver medal was awarded—the invention of Mr Jephson Rowsley, of Rowthorn, near Chesterfield. The object of this invention is to destroy the fly in the turnip-crop, and to apply at the same time a top-dressing of lime, &c. The means by which this is effected are very simple and ingenious; the box containing the lime, &c., is mounted on a frame and wheels like the ordinary drill; to the lower part of the frame a pair of fanners—one on each side of the machine—are attached; these receive rapid motion by means of a driving-band from a pulley in the driving-wheel. The fanners exhaust through one pipe and propel the air through the other. A curtain extends behind the exhaust-pipe, and, brushing over the turnips as the machine progresses over the land, disturbs the flies. As these rise in their endeavour to escape, they are caught by the blast, hurried up the exhaust-pipe, and ejected with violence from the other pipe mixed with the lime, &c., used as a top-dressing.

Messrs Garrett exhibited a specimen of their well-known "Horse-hoe," but with the new patent apparatus, by which the mortise-bar, containing the hoe-blades, is elevated or depressed. To enable the reader to understand the arrangement, we shall first describe briefly the mechanism of the original apparatus, and which we illustrate in the annexed sketch, fig. 1. To the main sill *a a*, brackets *e e* are bolted. These afford, at their upper extremities, bearings for a shaft *f f*. To this eccentric wheels *g g* are keyed. A lever *h* is fixed to the shaft

f f, by which the eccentrics can be moved through any desired portion of their revolution, and which can be maintained in any position thus given to them by the power of a ratchet-wheel *i*, which is fixed

Fig. 1.



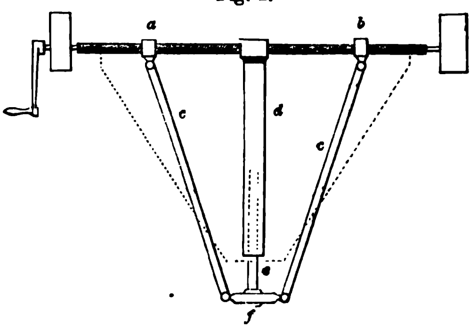
on the end of the shaft *f f*. The hoes *p p* are connected with the coulter-stalks *o o*, attached to the coulter-bar *w w*, to which chains, as shown in the sketch, are connected. These, passing over part of, and secured to, the V-shaped grooves made in the peripheries of the wheels *g g*. The coulter-bar *w w* is raised or depressed by means of the handle *h* actuating the shaft *f f* and wheels *g g*, the chains being tightened or slackened according to the direction in which the wheels *g g* are made to revolve. The lateral or side-to-side adjustment of the hoes, that is, the adjustment necessary to keep the hoes exactly in the line of the drills, is thus effected. On the opposite side of the main sill *a a*, from that shown in the drawing, two horizontal arms project. These carry vertical brackets, or swing-levers, jointed at their upper ends to the horizontal projecting arms of the main sill. These brackets are thus capable of a lateral or side-to-side motion. This lateral motion is given to them by means of a lever *u*, which is jointed to one of the buckets at the lower extremity. This lever, at its upper end, is jointed to the extremity of a lever attached to the shaft *r*, which is worked by a cross handle *s*. The two swing-levers or brackets are connected by a horizontal mortise-bar, which carries the horizontal levers to which the coulter-stalks *o o* are attached, and which are fixed at the other extremity to the coulter-bar *w w*. By the movement of the cross handle, the lever *u* is made to act on the swing-lever to which it is attached; and this, carrying

the mortise-bar, the whole of the coulter-stalks *o o* and *p p* are moved from side to side as required.

It is to an improved mode of suspending the brackets, or swing-levers carrying the mortise-bar, that the new patent of Messrs Garrett refers. At each side of the main sill *a a*, and in a direction at right angles to the shaft *f f*, a horizontal screw-shaft is made to revolve in bearings. This shaft is so fixed that it has no endway, but can only have a circular motion of revolution. It is divided lengthwise into two equal portions, one half having a right hand, and the other a left hand screw, the threads of the screw being inclined in opposite directions, thus /\. To each screw, traversing-nuts are provided. These nuts are continued downwards, and have at their lower extremities levers jointed to them. These hang downwards, and approach each other towards their lower ends, where they are jointed to the extremities of the mortise-bar. The right and left hand screws do not take up the whole length of the screw-shaft, but stop short near its centre, thus leaving a plain or unoccupied part. This plain part of the screw-shaft supports two hanging or swinging guides, the lower parts of which are hollow, and admit of bars which slide in and out, after the manner of the index-bar of the ordinary spring-balance. The lower ends of these bars sustain the mortise-bar, and serve to steady it as it is raised or depressed. The bars have distances marked on their outer faces, by which the extent of raising or depression of the mortise-bar from the ground is ascertained by inspection.

The screw-shafts have motion given to them by handles, which are passed over the square ends of the shaft, which project in the rear of the framing, near the position of handle *s*. According to the direction in which the handles are turned, so is the mortise-bar raised or lowered, the rotation of the right and left hand screws causing the nuts carrying the levers to approach to or

Fig. 2.

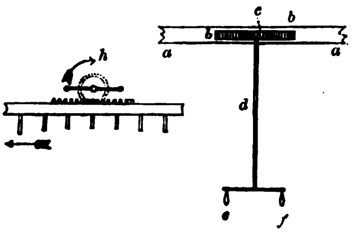


.ecede from each other, and raise or lower the mortise-bar. Thus, suppose the nuts *a b*, fig. 2, are passed inwards, the upper ends of the side-levers *c c* approach the guide *d*, on the slot of which the bar *e* slides up and down. This has a tendency to make the lower ends of *c c* to spring outwards; but this they are prevented from doing by being jointed to the cross-bar *f* of the bar *e*: the result of the movement is, that the cross *f* is pushed downwards, pulling the bar out of the slide *d*, and placing the mortise-bar attached to *f* nearer

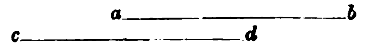
the ground. The outer ends of the hoe-levers being kept at the same level by means of the chains passing round the wheels *g g*, and attached to the coulter-bar *w w* (fig. 1), the angle of inclination of the hoes to the ground will be thus changed.

The same firm exhibited a very simple form of horse-hoe, the invention of Mr John Taylor of Swanton Norris, Norfolk, the nature of the arrangements of which will be understood by our examination of the annexed diagram, fig. 3. To the cross-bar *a a* the levers carrying the tines are fixed, this having an easy motion laterally, being swung on levers attached to the beam in the front of the carriage. To the upper side of the bar *a a* a rack *b b* is cast; with this a small pinion *c* gears, and which is actuated by the lever *d*, operated on by the handles *e f*. By turning these, the pinion *c* moves the rack *b b* from side to side, and with it the tines, which are thus adjusted between the rows of plants as desired; thus, by moving the handle *e f* in the direction of the arrow *h*, the cross-bar is moved to the left, as shown by the horizontal arrow.

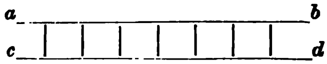
Fig. 3.



In the department of mechanism for preparing food for cattle, the most striking novelty was the Root-cutter exhibited by Messrs Ransome & Sims, and invented by Mr Biddell, their talented engineering manager. In this machine the cutters are stationary, while the roots to be operated upon are made to move in contact with the cutters. For this purpose the roots are placed in a circular receptacle or hopper, which revolves horizontally at considerable velocity. The periphery of this receptacle is not vertical, but slopes at a considerable angle, and is perforated with slips or apertures, through which stones, &c., are ejected. The hopper is not in one, but is divided into three compartments; the partitions forming these are not placed vertically, but slope inwards as they approach the bottom of the hopper—the slope not being right lined, but presenting a waved surface like that of the screw of a screw-propeller. The compartments are thus wider at the bottom than at the top; one side formed by part of the sloping periphery of the revolving hopper, the other two sides by the sloping curved surfaced partitions. This arrangement is such as to give the roots a tendency to press towards the bottom of the hopper, and to be kept in contact with the cutting edges. How these cuting edges are arranged will be seen by the inspection of the following simple diagram. The bottom of the hopper is not in a single plane, but one part in each of the compartments is elevated slightly above the other: thus—



Let the edge *a*, of the part *a b*, be sharpened to form a knife; as the root lying on the part *c* comes up, carried round by the revolving hopper, it is caught by the projecting ledge *a*, and a slice cut off it, equal in thickness to the distance between the plates *a b*, *c d*—which passes out at it, and falls on the ground, or into a dish prepared to receive it. No turnip can, therefore, escape till it is cut in slices of the desired thickness. The great desideratum of "cutting the last piece" is thus attained. As described above, the root-cutter is arranged to cut slices for cattle; a very simple device enables the same machine to cut slices or "fingers" for sheep.



Let the lines *a b*, *c d* represent a side view of the upper and lower plates of the bottom of the hopper, of which *a b* is the cutting edge. The breadth of the slices passing out from below these will obviously be regulated by the size of the turnip or cross section, which it presents at the time it is being cut; but suppose a series of cutters to be placed, so that the space between *a b*, *c d* is filled up at intervals with the edges of cross-cutters, as shown by the vertical lines, it is evident that the pieces will be cut into breadths corresponding to the distance between any two of the vertical knives. As the edges of these knives are placed at right angles to the direction of the knife or upper cutting edge *a b*, spaces are left, through which the slices pass outwards from between the knives. The vertical cutters are attached to a plate, hinged at one end to a point below the bottom plate of the hopper, and which, by means of a cross handle, outside the framing of the machine, is easily lifted up, so as to fill up the space in the manner shown in the last diagram, being retained in this position by a catch-bolt. On withdrawing the bolt, the plate falls down, leaving the machine ready to cut the roots into large slices. The change from cutting large to small slices, and *vice versâ*, is thus made instantly.

In this department of mechanism, Mr Bernhard Samuelson of Banbury, exhibited a Disc Root Pulper, the invention of Mr S. Brewer, of the same place. The improvements consist in the adaptation of simple arrangements, by which the slices, after being cut by the revolving disc knives, pass through openings in the disc to a receptacle, till they are taken up by a series of projections, cast, or otherwise formed, in the back of the disc, and radiating from its centre, and which force the slices through between a series of knives, which mince or pulp them. The disc is partially covered by shields, so placed as nearly to come in contact with the projections. Inside the shields are placed rows of projections, which pass between the projection in the disc as the latter revolves; a row of ... is also provided to the inside of the shield.

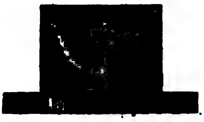
... noticed in straw-cutting machines, were

› of Mr Snowden of Gloucester, described in an article in this nal, on the Novelties at the Smithfield Show, and of Mr S. P. cer, exhibited by Messrs Higgins & Sons, the well-known iinists of Salford. In Mr Walker's machine, the knife is ght-edged, and can be easily removed when out of repair, and easily made by a country blacksmith than the curved knives he machines so generally used. The motion of the knife is tly similar to that of the connecting-rod which unites the ng-wheels of a locomotive engine, and partakes of a double on, lateral and downwards—thus imitating closely the razor-movement which is so essential to the attainment of a clean

The straw is fed up to the knife at intervals, coming forward i the knife is traversing that part of the stroke when it is out ntact with the straw, and remaining stationary when perform-he cut. There is therefore no loss of power from the straw ing up against the knife. The feed-rollers receive motion igh the medium of a vertical wheel, which is made to rotate on entre at intervals, by a click at the end of a lever, this lever ving a reciprocating motion from a face-wheel, to a stud in the of which the end of the lever is jointed. As this stud traverses ›t made in the face-wheel, and radiating outwards from the re, by moving the stud to or from the centre, and fixing it by rew, the length of the stroke of the elick-lever is altered as ed, and the length of "feed" regulated.

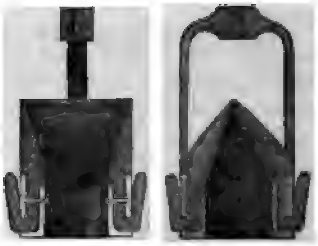
›ace only permits us to describe one out of the many appliances ›ited, useful on the farm, but not specially connected either with culture of the soil or the preparation of its products for market ›r stock. This appliance, which we have ted for description, is Perreaux's Patent a-rubber Pump-valve, by far the most nious, simple, and practically useful in-ion yet introduced for farm-pumps. In k we give a front elevation of the valve, in fig. 5 sections of bucket and plunger-valves. These valves onstructed entirely of india-rubber, and, as seen from the diagram,

Fig. 4.



the form of the mouth of a haut- the thickness of the sides nishing till they meet and form lips, which keep in close con- under any downward, but open ntly to any upward pressure. lips then open and close under slight variations of pressure; e they present, when opened ;, a clear water-way—the full ieter of the pipe to which they attached. The valves pass all extraneous matter tl

Fig. 5.



with ease—as straws in liquid manure, chips of wood, &c. &c. A further advantage possessed by them is, that however long the pump may remain dry, no water is required to be poured down the pump-barrel to prime the valves.

THE ABERDEEN SHOW OF THE HIGHLAND AND AGRICULTURAL SOCIETY.

This, undoubtedly the most successful of all the Society's meetings, has passed off with all the *eclat* which fine weather, an attractive locality, and a numerous and influential gathering of agriculturists and leading men of our day, could secure to it.

A comparative glance at the results of the last year's meeting at Glasgow, and of those of the present, may be interesting to some of our readers. At Aberdeen the entries of stock and implements were as follows:—

At Aberdeen.	
Cattle,	450
Horses,	189
Sheep,	590
Swine,	79
Poultry,	366
Implements,	802
	2476

At Glasgow.	
Cattle,	415
Horses,	240
Sheep,	669
Swine,	112
Poultry,	429
Dairy Produce,	234
Implements,	610
	2709

This shows an increase of 233 entries at the Aberdeen over those of the Glasgow Show; which would be increased to 467, if we take from the Glasgow entries those for dairy produce; a department altogether unrepresented at Aberdeen. The steady progress of the Society is perhaps still more strikingly evident when we compare the results of the present show with those of the show held at Aberdeen in 1847, eleven years ago. Thus in 1847 we find in cattle 361 entries against 450 in the present year; in horses, &c., 105 against 189; in sheep, 230 against 590; in swine, 24 against 79; in poultry, 102 against 366; in implements, 49 against 802; or a total number of entries of 871 against 2476, or a nearly threefold increase.

Of the 802 entries of implements exhibited this year, we find there 28 for two-horse ploughs for general purposes, 5 for trench, and 14 for subsoil ploughs; 17 double mould-board ploughs; 10 two-horse grubbers; 21 drill grubbers for green crops; 27 harrows; [illegible] Norwegian harrows; 7 consolidating land rollers; 5 pulverising rollers. Sowing machines of different varieties, 41; 12 broadcast; drill for grain; 10 for turnip sowing. Reaping machines, 10; thrashing-machines and steam-engines, 27; 2 singling turnip ma- [illegible] potato lifters; 9 horse rakes; 4 hand rakes; 18 dressing

fanners for grain; 11 weighing machines; 19 straw-cutters for power and hand; 14 turnip-cutters for sheep and cattle; 4 root pulpers; 3 steaming apparatus; troughs with racks for sheep and cattle, 12; linseed bruisers, 5; oil-cake bruisers, 8; grinders for power, 13; churns for hand power, 15; churns for power, 4; carts, 7; iron field-gates, 7; field-gates, partly of iron, 6; 80 extra implements were exhibited, and a general collection of miscellaneous matter of 259 entries.

The system of classification of the implements in the yard, to which we alluded at some length in our notice of the Glasgow Meeting in this Journal, still continues to attract the attention, and, to say the truth, not a little of the animadversion, of our leading implement exhibitors. For the purposes of the *judges*, the system doubtless is as convenient in practice as it is philosophical in principle. But it is worth while considering whether the wishes of the leading exhibitors who exhibit in different sections should not be attended to, and in some degree met. There can be no doubt that, for the purposes of sale, the present system involves, on the one hand, an expense, on the part of the exhibitors, in providing attendants at the different sections, to explain to purchasers, or intending purchasers, the features of the implements or machines they there exhibit; or, on the other, of neglecting this precaution, being unwilling to incur the outlay which attention to it involves, and simply allowing the machines or implements to speak, as it were, for themselves. But either alternative is not pleasant to be contemplated by business men, anxious to do a good business, to reimburse them for the expense of time and money which they incur in bringing their articles to the Show. Nor, in fact, are the exigencies of the case provided for by securing extra attendants; for business men know well enough that purchasers like as well to deal with principals as, on the other hand, principals like to deal at first-hand with purchasers. And many of our leading men can tell of numerous orders lost through not being able to get directly in contact with intending purchasers. It would be as impolitic in principle, as it certainly would be impossible in practice, to ask the exhibitors to forego their business views in coming to the Show, and to look upon it simply as a philosophically arranged museum, to fill up the departments of which they lend their articles. The truth is, they *show* in order that they may *sell;* and this consideration is with them—and very fairly and justly too—the primary one. Hence, seeing that their presence is all important to the attractiveness of the meetings, and that their presence is secured mainly by commercial considerations, it will be well, we think, for the Society to consider whether they can adopt such modification of their system of show-yard classification as will at once secure to the judges all the advantages of the present system, and permit the exhibitors, with least expense and trouble, to carry out their business views. That

this modification can be easily enough effected, we incline to believe, and in perhaps no better way than that suggested by some of our leading exhibitors, which is this: The present classification of the implements and machines in sections to be retained till the judges have made their examination and given in their awards; after which the exhibitors to be allowed to collect, from the different sections, their respective contributions, and to arrange them according to their own notion, in one place, immediately under their inspection. We have reason to believe that this selection and arrangement would be willingly done by many of the leading exhibitors, at their own expense. Sooner or later the point must be legislated for, for every succeeding Show gives indication of the growing dislike of the leading exhibitors to a system of classification which entails very considerable trouble and expense on a class of men who, contributing mainly, as they do, to the attractiveness of the Show, are entitled to every attention which can aid the business views which induces them, in no slight degree, to contribute to one of its leading departments.

In connection with the yard arrangements of the Highland Society's Exhibition, another point remains to be noticed. We refer to the absence of all shedding or covering to protect the implements, &c., from the effects of the weather. This, compared with the other point to which we have above adverted, is secondary in importance, and the disadvantages of which are not felt under cloudless skies and glancing sunshine, but which, nevertheless, assumes pecuniary importance in less propitious weather—when rain not only drenches exhibitors, but deteriorates, to a considerable extent, the value of their machinery. Certainly the rows of fine well-constructed shedding exhibited at the English, look more business-like than the bald, exposed, shelterless accommodation of the Scottish Shows.

In noticing the contributions to the Implement department of the Aberdeen Show, our task is comparatively easy; for so much of similarity subsists between the collections of the leading firms at the English and Scotch shows, that, when we have noticed one, we have in fact exhausted both, although it often happens that there are novelties at the one not exhibited at the other—those at the Highland Society's Shows being generally and exclusively Scotch. In the present instance, the Show gave evidence that it was more the desire of makers to excel in accuracy of construction and perfect finish, than in the production of novelty in agricultural mechanism—a commendable feature in these times, when we have seen so much of "invention run mad"—complication considered more valuable than simplicity of parts, and novelty of arrangement more than efficiency and economy in working.

In steam-cultivation, the only novelty presented to the Scotch [illegible] was Fowler's Steam-plough, the peculiarities of which we

shall fully explain in our next article. Following, therefore, as closely as possible, the natural order in which implements are used, we proceed first to notice the guano-distributing machine, exhibited by Mrs Sheriff of West Barns, Dunbar, and which took the prize. Those acquainted with Chambers's broad-cast manure-distributor, will trace a considerable similarity to its principle in the machine now under notice. There is, however, one important distinction between the two machines. In Chambers's, the manure can only be distributed broadcast; in Sheriff's, it may be either in broadcast or in drills. This change is effected very simply in Mrs Sheriff's by adopting a series of lids, shutters, or valves. These are placed at the bottom of the manure-chest or box, and are hinged at one end to the side of the box. When all these are lifted up, the guano is distributed broadcast; when one or two are opened, at the middle and each end of the series, the manure is distributed in rows with spaces between each, corresponding to the distance between the apertures uncovered. To prevent the guano arching over the apertures, and accumulating above them, a stirrer—constructed with a flat bar, with horizontal projecting fingers on each side of it—works backwards and forwards in the bottom of the manure-box, a little above the line of openings. This stirrer derives its reciprocating motion from the main driving-wheel, through the agency of an eccentric and connecting rod. The guano, passing through the apertures, falls upon a revolving cylinder provided with a series of projections, in front of which revolves a second cylinder, provided with a series of projecting forks or clearers, which work in contact with the projections of the first cylinder, scraping off the guano, and letting it fall to the ground in a pulverised condition. The price of this machine is £12. The judges *commended* a machine, exhibited by Robert Stewart of Carfin, for distributing guano, in which the leading feature was the employment of the same form of conical drum or canister so well known as employed in the turnip-sowing machine.

In reaping-machines, the first prize was awarded to a machine improved by Lord Kinnaird. We defer to another opportunity a description of its peculiarities of arrangement—his lordship being still engaged in perfecting its details—and pass on to notice a novel arrangement of delivering-apparatus, exemplified in the machine exhibited by Mr Samuelson of Banbury, the invention of Messrs Seymour and Morgan of New York. The grain, as cut by this machine, is delivered in sheaves at the *side*. The platform upon which the grain falls is flat, and covered with zinc, to facilitate its passage over it. The platform forms the quadrant of a circle, of which the radius is equal to length of cutter-bar or thereabouts. A rake, with a horizontal bar, with vertical teeth, sweeps across this curved platform, alternately in opposite directions—from the radius near the cutters, to the radius at the side of the machine. The

mechanism by which this alternate movement is effected is very ingenious, and to the mechanic will bring to his recollection the "mangle-wheel motion," to which it has some resemblance. Without the aid of drawings, it is difficult fully to describe it, but the following description may give the reader some notion of its peculiarities. A cast-iron frame or plate, curved in section and described from the same centre as the curve of the platform, is provided with teeth in the upper and under edges, and also at the ends, which are semicircular. A continuous rack is thus formed. A pinion working along the upper edge, revolves in one direction, but if still kept in gear with the teeth, and allowed to pass over the circular end of the rack till it engages with the teeth on the under side, will pass along it, but will revolve in the opposite direction. Suppose this pinion to be connected with a lever, which receives by a crank worked from the main driving-wheel a reciprocating motion from side to side, and with this lever the shaft or axis of the rake also to be connected; as the pinion works along one side of the rack, the rake will sweep across the platform in one direction, its direction of motion being changed on the pinion engaging with the teeth on the opposite side of the rack. The length of the rack is so proportioned, that while the pinion travels from one end of it to the other, the outer end of the rake sweeps along the outside of the quadrantalated platform from end to end. But another movement is yet desiderated. If the teeth of the rake always remained vertical—that is, at right angles to the face of the platform—it is evident that, on the rake sweeping from the side to the front of the platform, it would push off the cut grain which was lying on the platform ready to be raked off. To obviate this inconvenience, the shaft of the rake is capable of rotating partly on its axis, so that the teeth can be made to change the horizontal to the vertical, and *vice versâ*. While the rake is making its return-stroke—that is, from the side to the front of the machine—the teeth are horizontal; but coincident with the fall of the pinion from the upper to the lower assemblage of teeth in the rack, the teeth are made to assume the vertical position, thus falling amongst and ··tching the grain lying on the platform. This part-rotation of the shaft of the rake is thus effected. As the pinion passes from the upper to the lower side of the rack, and is connected with the rake, t is obvious that there will be a fall of the rake, and a rise on the ·inion changing from the lower to the upper side of the rack. The ·ak· is in its lowest position when taking the grain from the front ·· the side, and in its highest position when returning empty. To he end of the rake a pinion (*a*) is fixed; this gears with a rack (*b*), ·ich rises and falls with the pinion (*e*) passing round the rack (*d*); ·hen the pinion (*c*) is passing round the end of the rack (*d*) from the ··per to the lower edge of the rack, the rack (*b*) falls by its own ··ght, and actuating the pinion (·) on the end of the shaft of the rake, ··· the fourth ··· circle, changing the position of

the teeth from the horizontal to the vertical position. On the pinion (c) reaching the end of the lower edge of the rack (d), it raises up the circular end of the rack to engage with the teeth in the upper side: coincident with the rise of the pinion (c) is that of the rack (b); this actuates the pinion (a) on the end of rake-shaft, turning it round, and changing the position of the teeth from the vertical to the horizontal. They are thus relieved from contact with the grain, which is delivered at the side.

In the revolving reel of this machine which gathers in the standing corn to the action of the cutters, there is an arrangement worthy of notice. The horizontal bars of the reel, instead of being placed parallel to the shaft, are oblique to it. This places one end of the bars which strike the corn nearer the machine than the other, the consequence of which is, that they have less of the thrashing or beating influence which they possess when placed parallel to the shaft. When placed oblique, they exert, at the moment of striking the corn, little momentum; but as it sweeps along the oblique bars, it is brought gradually up to the action of the cutters, in a manner closely resembling the action of a man's hand, when, in performing the operation, inserting his hand at one side, he gradually brings his arm to bear upon the grain, instead of beating it directly down the whole length of his arm at once.

In the department of machines for preparing grain for market, the principal novelty exhibited was the patent dressing-apparatus for grain and seeds, invented by Mr Robert Hislop, junr., Prestonpans. This machine received the high commendation of the judges,—who also recommended the Society to give the inventor a silver medal, an honour well and worthily won,—and received great attention from many practical men, whose opinion is of value. We propose briefly to describe its principle of action. In the fanners ordinarily used, the grain is dressed (or rather attempted to be dressed, for in few machines is the operation at once completed) by two agencies—riddling, which may be termed the "test of size," and the action of a blast of air of determinate force, which having the tendency to blow away grains of lighter gravity, leaving those to drop of heavier bulk, may be called the "test of gravity." That none of those tests are applied successfully in the common fanners, is evident enough from the imperfect work they generally perform. In the ordinary fanners, the size-test is carried out by means of the reciprocatory riddle, a species of motion clumsy and philosophically erroneous, as compared with the easily regulated and continuous circular motion, the characteristic, be it here noted, of the most perfect of all our mechanism. In Mr Hislop's machine, circular motion is adopted in place of reciprocatory. A variety of advantages at once arises from this arrangement—ease in driving, slowness of speed, and an increase of surface in little space, over which the grain is conducted. The grain to be dressed is at once passed into the interior of a large cylinder of

wire-cloth ; this is provided with an archimedean screw, traversing the whole length, and so placed that the grain cannot pass from one end of the cylinder to the other, without following the convolutions of the screw. The grain is thus forced to come in contact continually with the wire-work ; and as the cylinder is 18 inches in diameter, and the screw takes four turns in a lineal foot, it passes over 19 feet 4 inches of wire surface in every lineal foot. This cylinder revolves at a slow speed, giving ample opportunity for the grain to pass through the wire-cloth at the apertures suited to its bulk. To suit different materials, the cylinder is not composed of one size of mesh ; the part of the cylinder near the end where the grain first enters, is made of fine wire, sufficient to pass wild mustard seed, inferior grain, and other seeds. These pass into a receiver fitted with a spout, placed at a sufficiently high elevation from the ground to admit of a bag or sack being placed beneath to receive the seed, &c. The second mesh of wire-cloth passes the " grey," and the third mesh the good or large corn. Sticks, and other larger substances, pass out at the end of the cylinder. The whole length of wire is kept clean by a brush, which is in contact with the upper and external part of the cylinder.

So far the operation of the "test of size." In analysing the operation of the "test of gravity," as attempted to be carried out in the ordinary fanners, we are at once struck with the defects of the apparatus employed. The blast being applied in conjunction with, and immediately below, the riddle, tends to defeat the very object for which the riddle is used—namely, to pass the good corn through, and to prevent any large body from falling through with it, and to pass it forward to the tail-corn; for the blast, acting below the riddle, prevents the good and large corn from getting through the meshes, passing them forward amongst the corn which, through deficient gravity, has been blown forward. The small space, moreover, afforded by the riddle, is the cause of the corn being passed over its surface in a thick, rather than a thin layer ; this in a great measure neutralising the action of the blast. The arrangement by which Mr Hislop obviates these disadvantages remains to be described. At the extreme end of and outside the revolving cylinder, a fanner revolves, to the action of the blast of which the grain is to be subjected. And here it is to be noticed, that the grain is subjected to the "test of gravity" *after* it has passed the "test of size," and being freed from all seeds and extraneous matter, is better fitted for the operation of the blast. The grain is passed through the openings of valves—which can be weighted if desired, to regulate the quantity passed through—the width of which is 3 feet 6 inches, thus exposing a thin and wide descending stream of grain to the action of the blast, which is thus made to exercise its influence on every single grain as it falls. By the arrangement of two small screws, revolving in opposite directions, any of the "grey" size, which is

of sufficient size to stand the blast, is carried off to the good spout. The good grain is also subjected to the blast, in which, if there is any pickles of different gravity, they are blown forward, and received in a trough fitted with a screw, which carries them to the "grey" spout. The good grain, which stands the test both of gravity and of size, is carried forward to a spout, from which it is delivered to bags or sacks. The machine can dress with ease ten quarters an hour, in a manner equal to three pairs of fanners, and is produced at a cost of £26. It is self-contained, supported on a cast-iron framing. Only one set of elevators is required to take the grain to the revolving cylinder. It does the work of three fanners, with an expenditure of power only sufficient to work one. We may possibly glance at the features of other novelties in our succeeding article—space preventing us from doing so in the present.

THE PHYSICAL CONDITION OF THE PEOPLE—THE RURAL LABOURER.*

We live in times which startle us by the ever-deepening contrast between the rich and the poor; and often this strikes us the more in consequence of the local proximity of those so widely apart in the social scale. *Lazarus* is next door neighbour almost to *Dives*. The finest streets and squares of our great cities are in the close vicinity of the huddled habitations of the squalidly wretched: the British Legislature, assembling in the Palace of Westminster, is within view of one of the disreputable parts of London, verifying the proverb as to the distance from grace of those nearest the church; for here filth, physical and moral, has accumulated under the very shadow of the noblest of English cathedrals.

As might have been anticipated, there is too often a most unneighbourly feeling between the very rich and the miserably poor. Neither of them have said so; and yet, somehow, they are aware of each other's sentiments, are kept apart by a kind of natural repulsion, and when they meet are consciously uneasy in each other's presence. They know that the kindly charities which should knit together man and man have not been observed between them, or

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* *The Agricultural Labourer viewed in his Moral, Social, and Physical Conditions.* By Martin Doyle. London: Groombridge.——*Transactions of the National Association for the Promotion of Social Science*, 1857.——*The Clodpole; or, The Normal Condition of Agricultural Labourers.* By A Working Man. Dundee: 1858.——*Report on the State of Agricultural Labourers.* By A Committee of the Synod of Perth and Stirling.

only in such scant and ungracious fashion as serves to deepen the "great gulf" which keeps them separate. If *Lazarus* has sometimes sulkily given the wall, and touched his hat to *Dives*, the latter remembers how little heartiness there was in his acknowledgment of such poor civility, and is very apt to entertain a most Cæsar-like suspicion that the "lean and hungry look" of his poor neighbour bodes no good, and that "such men are dangerous."

The same want of sympathy and brotherly goodwill is manifest in other quarters. We see it, often very painfully, in rural neighbourhoods. The gentry who live much in town are necessarily cut off from frequent intercourse with their rustic dependants, and from this cause, in combination with that reserve which is our national characteristic, the peasant too often shrinks from his superiors in station with an awkward sense of inferiority which it is painful to witness. The intercourse between the rich and the poor in the country is also most injuriously restricted by that *dolce far niente* course of life very apt to be followed by the possessors of great estates. Coming to the country for a few months during the shooting and fishing season, they are engrossed by those manly sports, for which town life has given them a double zest; and are so much among the hills and streams as to have little leisure for business details connected with the management of their properties. Hence their poor neighbours lack opportunity of propitiating their goodwill by little acts of friendliness bringing them into personal contact; and when the wealthy proprietor benefits his dependants not personally but through the intervention of a factor or law-agent, it is easy to understand how much is lost on both sides by such modes of conducting business or conferring favours. The friendly chat, the respectful but kindly inquiry after the members of the proprietor's family, the kindly look and manner of the one party, the glistening eye, the homely but hearty thanks of the poor man who has been gladdened by the granting of his request—all this is lost when the personality of the human being is kept out of view, and the lord or the laird is known only vicariously. Doing mischief by the intervention of others, they are not absolved from blame, but are bitterly reproached for sloth and inattention to the natural responsibilities of their position—while, as already hinted, their kindest actions are robbed of half their grace and impressiveness when not done by themselves in person.

This want of personal intercourse appears to be the cause of growing discontent and of very serious evils. The great proprietor has less acquaintance with his tenants than is either safe or seemly; the farmer is accused of caring too little for the education, the morals, or the physical condition, of his labourers; and the deplorable result is, that proprietors are not so beloved or so beneficent as we should wish them to be: farmers complain that their servants work for wages only, and not from love or duty. This growing

severance of the rich from the poor leads to the latter grumbling in a fashion sounding strangely and painfully in the ears of those who would fain see a practical exemplification of the doctrine that all men are brethren. When calamity assails the great, their humble neighbours, instead of generously compassionating their distress, sometimes congratulate themselves in this singular style, "Weel, the like o' that's a great comfort to puir folk." We are assured by clergymen that they hear remarks in this spirit. These poor people, cut off from the sympathies of the rich, see in their suffering undeniable evidence of their common humanity, and point to it with something of a malicious satisfaction. If they will not rejoice with them, or take pleasure in making them happy, *they must suffer with them!* This subjection to suffering "makes the whole world kin."

We are far from saying that this culpable want of sympathy between the rich and the poor is solely attributable to the faults of the former. If they too frequently neglect the duties of their station, the rural labourer not seldom repels their kindness by his dry suspicious manner, and by his scant and ungracious acknowledgment of even an important favour, as well as by his obstinate adherence to habits—personal and domestic—abundantly offensive to the more refined taste of his educated benefactors.

It is not our purpose to discriminate between the degrees of culpability which ought to be assigned to the respective parties whose united faults have made rural labourers what they are. Throwing the mantle of charity over both, we congratulate them on the appearing of many happy omens leading us to look hopefully to the future. For several years the condition of the labouring classes in general has been engaging the earnest attention of intelligent philanthropists, the result of whose inquiries has startled the nation, and made us acquainted with the heretofore almost unknown depths of a wide-spread misery. We are humbled, as well as horrified, by the recital of those social miseries which make such fearful annual inroads upon the public weal. Death's doings in the midst of us being now carefully recorded and quarterly published—the mortality of different classes of the people being analysed and proportioned—*data* for calculating a normal death-rate having now accumulated—we are astounded to be told that our people do not live out half their days; that every year 140,000 of them die unnatural deaths; and that 280,000 are constantly suffering from diseases not prevailing in healthy places; and that from the same causes their physical energies are impaired, and their affections and intellects deranged and diminished in a thousand preventable ways.*

In a previous article we demonstrated the special effect upon agriculture of the unnecessary slaughter of the British soldier on

* *Registrar-General's Quarterly Report,* May 1858.

home service. We showed that, in the year 1855-56, nearly 28,000 recruits were supplied by the rural districts, and that one-half of these, annually withdrawn from the pursuits of civil life, would not be required, if military mortality were in the same proportion as that prevailing in the general community. We selected the physical condition of the labourer turned soldier as one likely to prove interesting to the readers of this Journal. We had an additional reason for that selection: while much attention has been bestowed upon the social condition of our urban population, it is only of late that special notice has been taken of the agricultural labourer—the man who is the mainstay of our national greatness; for it is he that constitutes the greater—and by much the more vigorous—part of that army which preserves the integrity of the British empire; and to whom also must we look for a constant supply of that patient toil which maintains the productiveness of our soil, and is yearly extending the beneficent triumphs of agriculture. Having in this Journal published several papers bearing upon his interests, we desire to confer on him the additional benefit of yet further attracting public attention to his physical condition. And we rejoice that our efforts will be materially aided by works which have recently appeared, and some of which are indicated by the titles subjoined to the commencement of this article. *The Transactions of the National Association for the Promotion of Social Science* have an especial interest, because in them we have the information accumulated by many intelligent inquirers in regard to our national *physique*, and to vital statistics in general.

In directing attention to such matters, we are treating of what should be interesting to all having sense enough to take a lively concern in what affects individual health and comfort, as well as national strength and prosperity. Thews and sinews may not in our stage of civilisation be so pre-eminently needful as they confessedly are among nations less civilised: we are no admirers of mere brute force and animal activity. Still we look with dismay upon the townward movement of our population, when we reflect on the physical deterioration, which is the certain result, and upon the frightfully augmented mortality, which Dr Farr thinks can be shown to increase in proportion to the agglomeration of the population, in accordance with exact numerical formulæ. In the last spring quarter, while the mortality of the country districts decreased, the mortality of the town districts rose to 24.73; the average of the preceding ten years having been 23.94 in 1000.* So that, whether the excessive mortality of towns be inevitable or not, we have in this distressing fact undeniable evidence that we have not yet learned how successfully to resist the murderous poison generated by the decomposition of effete organic matter, which we are so insane as to

* [illegible] Report, 30th June 1858.

imbibe alike by night and day, in the air which we breathe, or in the water which we drink. The various morbific influences with which we choose to surround ourselves, in great cities especially, are injuriously telling upon the *physique* of the nation. "The Spitalfield weavers," says a late writer, "who were able formerly to raise among themselves a regiment of volunteers of good stature and appearance, are rapidly dwindling to the size of Liliputians." * There is ground for believing that the urban population of Great Britain, amounting to one-half of the nation, is really physically inferior to the other half; so that if we are not to become a permanently deteriorated race, to be replaced by one more vigorous, we have evidently to aim at two objects of the highest political importance. We must reduce urban mortality and physical degeneracy by assiduous attacks on every species of physical pollution; we must not allow the demon of dirt to hoist the death-flag over our depopulated cities, towns, and villages. Our second object should be to prevent our rural population making a nearer approximation to that shocking mortality which devotes 10 in 1000 of the inhabitants of London to preventable disease and untimely death, and scourges Liverpool and Glasgow yet more grievously. In the case of the metropolis, it is cheering to know that its huge extension has been attended by a signal diminution of mortality. At the beginning of the century the mortality of London was reduced to the rate of 29 in 1000; and in the 15 years, 1840-54, the rate further fell to 25, still remaining 10 in 1000 above the healthy rate for London.

Those not living in the country may fancy that there is little need for directing attention to the physical condition of our rural districts. This, unfortunately, is only fancy. The mortality in such districts is, no doubt, comparatively small: for example, Liverpool is the unhealthiest city in the kingdom; during the ten years, 1841-50, the annual average mortality of all ages was at the rate of 36 in 1000. Glendale and Rothbury are the healthiest rural districts in England. During the same decennium, their average mortality for all ages was only 15 per 1000.† The like difference between urban and rural mortality prevails in Scotland. During the year 1857, the inhabitants of towns died at the rate of 244 persons per 10,000, or 1 death for every 41 persons; whereas in the rural districts the mortality was 157 deaths per 10,000, or 1 death for every 63 persons. The proportionate mortality in town and country being thus remarkably diverse, it may be thought that by quoting these proportions, as furnished by the Reports of the Registrar-General, we are furnishing materials for demonstrating that we need not trouble ourselves as to the sanitary condition of the peasantry, because in regard to them the ravages of disease and death have been reduced

* *On the Rapid Increase of Town Population.* By JOHN BEDDOE, M.D.
† *Sixteenth Annual Report of the Registrar-General,* p. 149.

to a *minimum!* As Scotsmen we have reason to be thankful that, so far as a three years' average can determine such a point, the mortality of Scotland is considerably below that of England, the relative proportions being 200 deaths to every 10,000 persons in the former and 216 deaths for every 10,000 in the latter; a saving of life most note-worthy, for had the mortality of England during three years been the same as in Scotland, 91,392 lives would have been saved, or more than enough to make up for all the losses in the Crimea. But a little consideration teaches us that we have no reason for fancying that we have attained such a state of physical perfection that our conflict with disease and death can be carried no farther. The Registrar-General is no flatterer: he tells us in those dismal tables of his, in which he quarterly proclaims death's victories and our follies, that in so far as Scotland is concerned, it would be fair to consider all the deaths above 150 in every 10,000 of the population as unnatural deaths, which might have been prevented by due attention to the laws of health. Hence in Scotland there may be said to have been 46,155 suicides during the last three years; such being the number of lives which might have been saved! If such a loss of human life were incurred by a triennial earthquake toppling our houses about us as we slept, we should deem ourselves the most unfortunately situated people on the face of the earth. It is incurred quietly; we invite the destroying agency into our houses; it abounds in our cottages, and is not excluded from our lordly mansions; and we think little about it! There are multitudes among us who know almost nothing about the physical condition of the people, and imagine that because they supinely submit to premature decay and death they have no reason to complain. It is right for their own sakes, as well as for the sake of others, that such incurious ignorance should be dispelled, and that we should do away with the foolish notion that because rural neighbourhoods—sparsely populated—are not so insalubrious as those huddled masses termed great cities, we have nought to do but admire the beatitudes of those that lead a rural life. We must, therefore, inform the urban population not only that it—one-half of the British people—is physically inferior to the other, but also that its further deterioration is likely to be less extensive in proportion as the excess of births over deaths in the rural population is greater than in the towns. If rural life becomes as brief and precarious as that of those dwelling in cities, the British race must rapidly degenerate; because from the country we shall no longer draw those supplies of vital enery, the accession of which hinders the exhaustion of the national vigour.

To nurse the *physique* of the rural labourer lest there be a ...nished supply of national *stamina*, may to some appear as ...sly provident for the future as the parsimonious use of coal, ...haus... the supply of subterraneous fuel. And yet it is not

so: the condition of the rural population, even in regard to material characteristics, is far from satisfactory; and those possessing the best means of information are well aware that the state of morals and education is deplorable. It is no doubt perfectly true that when you educate a rustic, and raise his moral nature by spiritualising his affections, he is a new man in the highest sense of the words. But all experience is our witness that the efforts of Christian philanthropy are always hindered, and often frustrated, by the pitiable physical condition of those whom it would befriend and elevate. "Education," said the lamented Dr Arnold, "is wanted to improve the physical condition of the people, yet their physical condition must be improved before they can be susceptible of education;" and, he might have added, of religious impressions. We constantly hear of the difficulties which the clergy meet with in the discharge of their spiritual functions, in consequence of the physical degradation of their poor parishioners; and the obstructions thus thrown in the way of the medical profession are not less notorious. For example, the Rev. Dr Guthrie, whose labours for the outcast youth of Edinburgh have gained him the blessing of those ready to perish, was one day exhorting a poor old woman whom he found dying in a miserable room in the Cowgate, Edinburgh. To his remarks upon her nearness to eternity, she answered with the piteous cry, "I'm cauld and hungry." Being reminded that there was something worse than cold and hunger, the poor creature replied, "Ay, but, sir, if ye were as cauld and hungry, ye could think o' naething else." How impressively does this old woman teach us how hard it is for virtue and happiness to be found where physical wretchedness predominates! It is in vain to expect mental refinement, or attention to the decencies of civilised existence, from, it may be, eight or ten persons of either sex, living within the straitened dimensions of the one room of a dilapidated cottage. While yielding to none in the wish that the clergy should ply with spiritual appliances the humbler members of their flocks, we must say that we rejoice to see the clergy taking a greater interest in matters affecting the temporal good of the community; and still more gratified are we to know, that when they speak the language of kindness, truth, and sobriety, in regard to the manner in which the peasantry are provided with houses, food, and clothing, their remarks and suggestions are generally treated with respectful attention. It is well known how much good was done by the late Rev. Dr Gilly's exertions for the Northumberland peasantry; and we also know that great benefit has resulted from the labours of the Rev. H. Stuart, and of the Synod of Angus and Mearns, to which he belongs.

A French wit has said, "English society is like a barrel of its own beer—the top is froth, the bottom dregs, the middle excellent." Lamartine, let us hope, appreciates us more justly when, after long absence, he returns to England, and writes thus: "It was impos-

sible for me not to be dazzled by the immense progress in population, in industry, and in wealth. But especially deserving of notice are the ever-multiplying charitable institutions, the many associations of real, religious, conservative, and fraternal socialism between the different classes. These prevent explosions by evaporating the causes which produce them—stifle murmurs from below by conferring benefits from above—close the mouths of the people, not by the brutalities of the police, but by the arm of public virtue." It is true that society in this country is characterised by what Lamartine calls "fraternal socialism:" we have a horror at socialism of the liberty and equality school, reckoning it a madman's dream; but we have among us good feeling and true religion enough to make us feel for social wrongs and misdeeds, and be willing to associate our efforts for their removal. But large towns inevitably are the first to be benefited by such associations; mental activity and facilities for organisation being more abundant there than in the country. Hence the condition of the rural labourer has not yet received the consideration bestowed on that of the working-classes in towns; neither has it yet had the advantage of those sanitary improvements which it likewise greatly needs. In some quarters there is an indisposition to believe that matters are not right in the country—people have vague notions about fresh air, and rude plenty, and seem actually to believe that "chawbacon" is the rightly-bestowed nickname of the agricultural labourer.

The happiness of one-half of the people of the British islands, the present prosperity of the United Kingdom, and the future destinies of the British race, must not be left to accident; we cannot afford to be half-informed as to the true state of the peasantry. We have too long been willing to believe in the poetical nonsense of Virgil as to the "too great happiness of husbandmen, if they only knew it." We read a notice of a book, the other day, entitled, "A Monograph of the Genus *Bos;* comprising Bulls, Bisons, and Buffaloes, with numerous illustrations." We have much more need of a monograph of that species of the human genus which, according to the son of Sirach "glorieth in the goad, that driveth oxen, and whose talk is of bullocks; who giveth his mind to make furrows, and is diligent to give the kine fodder." Our limits will not permit a thorough investigation of the peculiarities of his position; nevertheless, we should like to have it said of us that we had served our generation by doing something to make known and ameliorate the condition of the rural labourer.

In answer to the question, "How does he live?" it is manifest that no satisfactory answer can be given till we know what he has to live on. The question of wages is of paramount importance to the labourer: it is to him the measure of the possible and the probable. Whether he shall wear rags or comfortable clothing; whether live in a vile hovel or a neat cottage; whether acquire the full development of his mind and body, or be stinted in both, is mainly

lependent on the amount of his daily earnings. Policy demands that in all our dealings with him we shall bear this in mind. Religion teaches that we shall not exact from him the *maximum* of work at the *minimum* of cost. "Masters give unto your servants that which is *just* and *equal.*" Let us inquire how these axioms of civil and religious polity are acted upon, and endeavour to ascertain how many rural labourers get "a fair day's wages for a fair day's work." We shall restrict the inquiry to England and Scotland, because in Ireland the price of labour is at present in a state of transition, and we wish to found our remarks on the long-established usage of portions of the kingdom more favourably situated. Were we to publish certain facts in regard to the physical condition of the Irish peasantry, nobody would be surprised, so long have we been accustomed to hear of their wretchedness. But when we draw aside the curtain of ignorance which hides from so many the true state of "the cottage homes of England," which, according to Mrs Hemans, are "by thousands smiling on her plains;" when we give a true picture of the Scottish "cottar's fireside," we bring something new to the ears of many who ought to know better.

According to the census of 1841, the number of agricultural labourers in England and Wales, including women and children, was 966,271; and we doubt not many will be surprised to be informed that the average wages of an agricultural labourer cannot be estimated at more than eleven shillings a-week, and that they vary greatly in the different counties. In Lincolnshire, where the custom prevails of allotting small portions of land to the rural labourer, he seems to attain the greatest degree of comfort, his wages amounting to 15s. We have just been informed by a gentleman, who employs about forty labourers all the year round, that in Surrey a well-behaved labourer earns as much, and that in his cottage of two or three rooms, for which and a garden he pays a rent of L.3, he is very comfortable. Next in order, according to the social condition of the peasantry, come the counties of Northumberland, Cumberland, and Westmoreland. In all of these, the only class which can be said to live in decent comfort is that of the allotment holders. Those entirely dependent on daily wages can only, by dint of hard labour, obtain the bare necessaries of life; and when assailed by sickness, or unable to procure work, at once lapse into pauperism. In Dorsetshire wages only average about 8s. per week; and though many of the labourers have other advantages in addition to this payment in money, there are very many able to earn only this scanty pittance. In Wiltshire wages are rather lower; and in Somersetshire they are so low as 8s., 7s., and even 6s. per week. Having thus exhibited the highest and lowest wages of the rural labourer, it is unnecessary to detail the rates prevailing in the different counties of England. Our information is derived from Mr Thornton's work *On Over Population,* published in 1846. Unhappily we cannot cherish

the hope that the physical comforts of the English peasant are now greatly increased. That hope is repelled by statements on "Labour and the Poor," published by the *Morning Chronicle* in 1850, and yet more recently in *The Agricultural Labourer*, by Martin Doyle, published in 1855. In the latter of these productions there are numerous carefully prepared tables, showing the weekly income and expenditure of agricultural labourers, and also, in contrast with their scanty fare, the average dietary afforded in the Unions in England and Wales. In these Unions men receive per week 119½ oz. bread, 9 oz. cooked meat, 4½ oz. bacon, 15 oz. pudding, 13¾ oz. cheese, 42 oz. vegetables, 1¾ pints pea soup, 14 pints gruel. We have a statement of the expenditure of the family of an agricultural labourer, containing six persons, earning 11s. per week. It contains these items—Provisions: 6 to 8 lb. loaves, 8s. 6d.; sugar, 2d.; tea, 3d.; butter, 3d.; costing 9s. 2d. Necessaries: soap, 2d.; candles, 2d.; firing, 6d.; costing 10d.; rent, 1s. In all 11s. So that, with no bacon, cooked food, cheese, vegetables, and no allowance for clothing, the precarious weekly wages of such a family are entirely expended, without the possibility of laying up a farthing for contingencies; the means of education being wholly unprovided for. "It will not be difficult to show (see tables 8, 9, and 10) how this dietary might be considerably improved without increasing the weekly cost. Still, however, it is doubtful whether any improvement of which it is susceptible would remove the sad but just conclusion, that with the average wages paid in the southern and midland counties of England, the labourer with a large family cannot afford as much, or as good, food, as regular paupers receive in English workhouses, or criminals in jail."

We find this doleful account of "Merry England" confirmed by all that we read in "Labour and the Poor."

On looking into the returns of the Inspector of Prisons in the southern and western district for the year 1847, I find that the average total annual expense on account of each prisoner was L.27, 9s. 9d. Now, at the rate of 8s. a-week, a labourer's wages amount to L.20, 16s. in the year, provided his vork be constant. Even if he has none to support but himself, he cannot ·pend upon himself as much as the public, in the district in question, spends n each prisoner. But if he has a wife and five young children to support, ne average expenditure on account of each member of his family, is about ..3 a-year, or about one-ninth of what is expended on the prisoner. If the ·hole family were in jail, instead of living on the L.20, 16s., to which they ... limited out of jail, the aggregate cost on their account to the public ould be nearly L.200. The expenditure per week on account of each member of a family of seven, under the circumstances supposed, would be about s. 1½d., whereas the actual present weekly outlay upon each pauper in ne of the most economically managed workhouses that I have seen, that of iskeard, is about 2s., exclusive of his proportion of the general expenses of [illegible] hese included, th[illegible] rage [illegible] uld be nearer 4s. than 2s.

The 2s. merely include what is expended for diet and washing. These comparisons are both curious and instructive.

Yes; and very deplorable, surely. And the deteriorated condition of the rural labourer, in many of the chief agricultural counties of England, is rendered more apparent if we reflect, that after his scanty wages have been expended on meagre diet, far below that of a prison, he is still without clothing, which the State provides for the convict. His difficulties in this respect are distinctly exhibited by Martin Doyle's statement, showing the quantity of clothing (with the price of the same) properly required for a male and female adult, for a boy able to work, and for children of both sexes, from three to six years of age. It extends over three years, and previously to the first year it is assumed that the family was destitute of clothing. From this we learn that the average expenditure for clothing to a man is 9½d. per week, or L.2, 1s. 4d. per year; to a woman 6d. per week, or L.1, 4s. 11d.; to a boy from ten to thirteen years of age, 6½d., or L.1, 9s. 2d.; to a male and female from three to six years of age, 3¼d. per week, or 14s. 10d. That is to say, clothing for a man and his wife and two children, of the respective ages of thirteen and six, would cost L.5, 10s. 3d. And our readers must not fancy that such a labourer and his family will exhibit any superfluity of raiment. His trousers of corduroy, renewed twice in three years, only cost 5s. 4d. a-year; and none of the family wear flannel save the wife, whose two flannel petticoats, also renewed twice in three years, only cost 2s. a year. To those who disdain not to listen to "the short and simple annals of the poor," it may be interesting to know that his shoes cost 14s. 8d., and those of his wife 9s. 4d. a year.

After perusing such statements, we can hardly be surprised to read in "Labour and the Poor"—

Ask any one "how families can live on 7s., 8s., or 9s. a-week?" and the answer invariably is, "they can't do so *honestly*." The inference is irresistible, that they live dishonestly; and so the great bulk of them do. This is more particularly the case as regards the article of fuel. In general I find them open, unreserved, and communicative on almost all other subjects; but the moment I touch upon the subject of fuel, their whole demeanour, in most cases, undergoes a change, and their awkward and incoherent statements are often in perfect contrast to their former readiness and consistency in reply. Throughout the greater part of Somerset, and, I may say, the whole of Bucks, Berks, and Oxford, where they have nothing but wood or coal to burn, one universal system of pilfering prevails in respect to fuel. It is generally through the instrumentality of the children that the wants of the household are thus supplied. What is the consequence? The child who becomes an adept in stealing wood is soon qualified for robbing a hen-roost. From that, again, to stealing a sheep, there is but another step; and when a man goes out to steal a sheep he is ready for any thing.

In Martin Doyle's estimated expenditure of an agricultural labourer, only 6d. per week is allowed for fuel. When sitting by

our cheerful hearths let us bear this in mind, and instead of severely condemning this wretched system of pilfering, we shall be ready to use the compassionate language of Solomon—"The destruction of the poor is his poverty." "Men do not despise a thief if he steal to satisfy his soul when he is hungry."

Having thus shown how he lives, we naturally turn to the consideration of the English agricultural labourer's dwelling. In Scotland this point has recently received much attention, and called forth much animadversion—deservedly, no doubt; and yet we must say that our inquiries lead to the conviction that, upon the whole, matters in this respect are worse in England than in North Britain. The Report on Agricultural Labourers by a Committee of the Synod of Angus and Mearns, published in this Journal of July 1856, is abundantly distressing in regard to household accommodation. Still it does not pain us so deeply as we have been pained by our investigation into the family arrangements of the greater part of the peasantry in the purely agricultural counties of England. "The number of inhabited houses in Great Britain has nearly doubled in the last half century; the number of persons to a house has increased from 5.6 to 5.7, consequently the increase in the number of houses has not quite kept pace with the increase in the population."* There is reason for believing that this decrease in the number of houses, in proportion to the people, has been greatly influenced by the policy of landed proprietors both in England and Scotland, in reducing the number of small farms, feus, and labourers' dwellings. For instance, many years ago the late Michael Sadler stated in the House of Commons that in 1690 there were in the county of Suffolk 47,537 houses, but only 42,773 in 1821, although, in the interval, the population had doubled. There is ample reason for believing that deficient accommodation is the bane of English rural districts in general. It is constantly alluded to as a frightful social evil in the *Morning Chronicle's* celebrated letters on "Labour and the Poor;" in the writings of the Rev. S. G. Osborne, Rector of Bryanstone, Dorsetshire, and the well-known S. G. O. correspondent of *The Times.* "I saw," writes Mr Osborne, "in a room about 13 feet square, three beds: on the first lay the mother, a widow, dying of consumption; on the second, two unmarried daughters; on the third, a young married couple whom I had married two days before." In the *Transactions of the National Association for the Promotion of Social Science* there are important papers "On Houses for Working Men," by the Rev. C. H. Harthorne; "On Labourers' Cottages," by T. R. Bracebridge; and "On the Influence of Habitation on the Community," by W. H. Michael. Each of these papers is a terrible illustration of one of Mr Chadwick's con[illegible] is namely [illegible] that the younger population, bred up under

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* [illegible] Edward Cheshire.

noxious physical agencies, is inferior in physical organisation, tending to become short-lived, reckless, intemperate, and little susceptible of moral impressions." How can it be otherwise when perhaps eight human beings, with average wages of little more than the same number of shillings, live in the single room of a miserable cottage, within which the observance of decency is impossible? Sir Arthur Hallom Elton, of Clevedon Court, near Bristol, gives the following graphic sketch of the home-life of a young labourer:— "Home has no attractions for him. When he goes there, tired and chilly, he is in the way amidst domestic discomforts; the cottage is small, the children troublesome, the fire is diminished, the solitary candle is lighted late and extinguished early; he treads on the children amidst an explosion of screams; is perpetually taking his father's chair by the chimney corner, and frequently leaving dirty thumb-marks on the linen his mother is getting up for the squire's lady. If he goes to bed early, his elder brother, who sleeps with him, awakes him an hour after with a kick; if late, is scolded by his mother for disturbing the four children who sleep in the next bed to his own. He naturally then goes to the public-house, where a cheerful fire and jovial society are found, and becomes a loose character, and in a short time is ashamed to meet his clergyman, and then becomes discontented with him and all his real friends, breaks from all teaching, and falls into habits of coarse self-indulgence."*

This is not a fancy sketch. The relieving officer "of one of the very best cultivated districts," has enabled Martin Doyle to construct a tabular statement exhibiting the moral, social, and physical circumstances of twenty families within an area of 12,000 acres, in which the deficiency of house-room is a prominent evil. We take No. 5; and reading the table continuously, we find that the family consists of seven persons, whose united weekly earnings amount to 22s., the average weekly income, after paying the rent of 1s. per week, being 3s. 1¾d.; that none of them can read or write, except two, who read imperfectly; that they belong to no religious denomination; that their character is doubtful; that they all sleep in one room, which affords 141 feet cubic space to each inmate; that the cottage is very filthy; that there is no garden; that there is one bedstead, no change of linen; and that the furniture is very dirty; that three of them sleep on the floor; and that the wife appears to be a bad manager. Glancing at No. 4, a well-educated respectable family, attending the Church of England, the wife being a good manager, we find that eleven persons sleep in one room, with a space of 122 cubic feet to each; that their weekly earnings, 15s., are inadequate; that they have no change of linen; and that it is with great difficulty that the younger children are kept at school.

* *Agricultural Gazette.* 1853. P. 107.

This table is valuable, inasmuch as it enables us to illustrate the over-crowding of cottages, by comparing their cubic space with that of barracks, hospitals, and poor-houses. The minimum cubic space allowed to each soldier is 450 feet in barracks, and 600 feet in hospital; and the Army Commissioners recommend that these figures be increased to 600 and 1200 respectively. Sir John M'Neill states that the pauper in the Scotch work-houses is allowed 480 feet per bed, and that this minimum is not only insisted on, but that it is practically much exceeded, as the workhouses are never full, and the dormitories are never occupied during the day.

We cannot at present lay our hands on a prison-report, showing the space allowed to a prisoner in his cell. We know, however, that we treat him so tenderly that we may confidently affirm that he has "scope and verge enough," and that he is not "cribbed, cabined, and confined," as he would be were he an inmate of "huts where poor men lie."* If we bear in mind that England provides not only food, raiment, and ample house-room, for the pauper and the felon, but also education and religious training, while there is no national provision for the children of the honest labourer, it must be owned that "there's something rotten in the state" of England; and that she is a mother most unaccountably capricious in the treatment of her children. We do not say that paupers and criminals are too well treated, though many are of that opinion; but we do say that it is matter of profound astonishment and regret that the noble qualities of the English labourer should be repressed by the low type of his physical condition; and that, by the lowness of his wages, his bodily energies should be prematurely exhausted.

In Scotland the wages of the rural labourer, and the manner in which he lives, are not so deplorable. If hired by the year he has about £19, six and a half bolls of meal, four bolls of potatoes, and three quarts of new milk daily; besides being provided with a house, a small garden, and very often an allowance of fuel. Recent researches prove that the oatmeal and milk, on which he almost wholly lives, possess in a remarkable degree those substances which form muscle; and assuredly the brawny aspect of the Scottish ploughman does not belie the conclusions of the chemist. Still there must be room for improvement in his physical condition, when, though little more han fifty years of age, he is reckoned unfit for the hard labour of he field, and must sink down into an "orra man," who does any-ing he is fit for about the farm, or must retire to the nearest town illage in search of employment.

he rural labourer, receiving daily wages in Scotland, is also bet- off than the English peasant. At present his wages may not rage 11s. a-week, which appears to be about the average wages of rural labourer in England. He may never receive 15s. a-week as

* [illegible] have, since writing this [illegible] informe[illegible] hat each prisoner is allowed an [illegible] of 756 cubic fee[illegible]

in Lincolnshire or Surrey, but neither does he sink so low as the Dorsetshire labourer, with 7s. or 8s. a week. And owing to the cheaper nature of his food, and his native prudence, he often rears a numerous family of stalwart children, by whom at last he is decently buried. This description of the Scottish peasantry refers only to the Lowlands. In the Western Highlands, and in the adjoining islands, such used to be the destitution that, during part of almost every year, from 45,000 to 80,000 persons were dependent on charity;* and we fear that great is still their misery. The grand source of physical deterioration in Scotland, as in England, is the inadequate house accommodation of the rural labourer. Two years ago the Synod of Angus and Mearns expressed in strong terms its sense of this grievous evil; and from the recently published Report on the State of Agricultural Labourers within the Synod of Perth and Stirling, we perceive that the state of the cottages and bothies in these counties also calls for much improvement. Cottages with the roof in a state of disrepair, the floor of beaten earth, damp, and full of hollows; the windows small, and not made to open, so that the clergyman and the medical attendant break them for the sake of fresh air; insalubrious and indecent huddling together of young and old, male and female, sick and well, living and dead;—with all this we are unhappily familiar. And having often suffered the greatest distress while visiting the sick in such wretched dwellings, from the vile atmosphere with which they are saturated, we must say that we do not wonder at the "shrinking tendencies" which the Rev. H. Stuart candidly admits have been displayed by him when ministering to the spiritual wants of the rough and dirty inmates of a bothy. We can at this moment remember, in our immediate vicinity, at least ten cottages, the ceilings of which are not above six feet high; and the doorways of which are so low as to constrain the inmates to bend in order to avoid being knocked on the head. The power of the human system to wrestle with noxious influences is mercifully great, otherwise the mortality in such cottages would be terrible. It is kept down, however, by the habits of the inmates. The door is almost always open, and the labourer is often in the open air from morning till evening. With his return home begins the evil which saps his strength. Short-sighted policy has, perhaps, razed every cottage near the scene of his daily toil, so that every day he may have to trudge several miles. With nerves unstrung by labour, and every pore exhaling perspiration, he lies down to rest in a room occupied by all the members of his family, and destitute of the means of ventilation, because the narrow window frame is immovable. Hour after hour he inhales the poisonous carbonic gas, exhaled by the lungs of so many sleepers. He repeats the daily round of exhausting toil, followed by his nightly plunge into this poisonous atmosphere; "balmy sleep" proves to him that worst of enemies—a foe in his own house, who

* *Report of Highland Emigration Committee*, 1841.

nightly sows, in the open field of his prostrate body, the seeds of that malady which shall, ere long, unnerve his brawny arm, or send him to an untimely grave. The carelessness and ignorance of the Scottish peasantry in regard to matters sanitary is dreadful. We often find hideous pigsties right under the one window of the sleeping room, and near the door a fetid pool, always dangerous to children, and in which we have known that an infant has been drowned! The odours, clinging to the clothes of persons dwelling in such houses, is most annoying to noses unaccustomed to them; and we speak what we personally know, when asserting, that to sit with a number of them for an hour in one's own well-aired apartment, is a sore trial to the sense of smell. This source of annoyance and debility is aggravated by the uncleanly personal habits of the people. Their application of water is too often limited to face and hands; and we are persuaded that, after attaining manhood, multitudes have never washed their whole persons; possibly because sharing the notion of the colliers, in certain districts, as to water weakening the back!

It should not be necessary to point out the physical results which must follow from modes of living so insalubrious. Such houses as we have been referring to must almost necessarily be in a "muddle," and where all is confusion and dirt, how truly pitiable is the condition of the inmates! The "working-man," who so well describes "The Clodpole," exclaims: "One apartment for kitchen and bedroom in health and in sickness, for birth and for death, to dress and to undress; and where the common decencies that belong to our nature are comparatively disregarded and set aside, not by consent of the inmates, but against that consent, and by the dire necessity of the case! Who can estimate the consequences naturally resulting from such a state of things? Should fever or any other epidemic enter into such a family, as of course it occasionally will, where the healthy and the diseased must sleep in the same apartment, or are in many cases cooped together in the same bed, not by twos, but by threes and fours, as the case may be, we need not be surprised very much when we hear now and then of that dreadful scourge of the young—scarlet fever—sweeping over a district or country side, writing this and that man childless, and desolating the hearth and the home."

As might have been anticipated from one familiar with what he describes, the author of *The Clodpole* is indignant at the bothy system, and furnishes us with illustrations of its injurious effects on the physical condition of the rural labourer. "Many are the comfortless bothies that are scattered over the country; and sad enough to think of the after effects of these on the constitution of the ploughmen, compelled to sit in their drenched clothes at night, with no fire to dry at, and again to have them to draw on in the morning not dry, but merely 'weel drippit.' The constitutional coughs, and the irremediable rheumatism which prevail among our elderly

ploughmen, are clearly traceable to such a mode of treatment." Although a Perthshire man, our author evidently has no sympathy with the Perthshire clergyman, who, according to the Synodical Report already referred to, "does not disapprove of the bothy system; it makes the men social." The reverend brethren of this singular gentleman denounce the bothy system as on the whole unfavourable, one member of the Perth Presbytery denouncing it as "the worst possible;" another as "very prejudicial as at present worked;" while three declare it "very bad."

It is also too truly remarked that "there is yet another mode of housing unmarried ploughmen in the stable loft, that is, in an open department right above the horses." "There may be the absence of the shivering coldness of the fireless bothy, but there is present the sensible feeling of a *certain* kind of heat generated down stairs. There is no purer air to breathe than that which has been carbonised in the lungs of the animal under-tenant, commixed with the fumes of ammonia, making the aggregate element which the poor ploughman must breathe for 365 nights in the year. This disregard to the ordinary means of maintaining health is no doubt the parent of many a pulmonary complaint, and it germinates the seeds of consumption in many a youthful constitution."

There is too much reason for also asserting that the farmer's "own house is built agreeably to the status of his farm, or the comfort of his family; and his farm-steading is made to his mind, 'trig and trim' in every particular down to his poultry-yard and pig-stye; and the only things overlooked and neglected in all that establishment, in the article of comfort, are the bones and sinews, the soul and the body of the poor uncared-for ploughman, upon whose devoted head, in sunshine and shower, in frost and in storm, the primitive curse seems to fall heaviest. "In the sweat of thy face shalt thou eat bread."

We have thus glanced at the contents of the various works, the titles of which appear at the commencement of this paper. We have, with their assistance, as well as from personal knowledge, described the physical condition of the rural labourer. We have indicated the existence of deep-seated and wide-spread social evils. And yet we are aware we have not indicated some which are still more to be deplored. We have not touched upon what is emphatically termed, "the delicate question," which is so intimately connected with the physical condition of the people.

In a concluding paper we shall treat of the wives and daughters of rural labourers, and endeavour to demonstrate that the number of illegitimate children in the rural parishes of Scotland, about which there is at present such an outcry, is the natural result of those evils which we have been describing. We shall also direct attention to various recent efforts and suggestions for the amelioration of our agricultural population.

AGRICULTURAL IMPLEMENTS AND MACHINES.*

THE application of mechanics to agriculture must always be regarded as one of the principal sources of its prosperity and advancement. It was by the improvement of the rough and cumbrous implements of early times that it first emerged from its primitive rudeness; much of its present state of unexampled prosperity is to be ascribed to the mechanical skill that has been exerted in its service; and it is to a new application of mechanical agents that we are doubtless to look for the next great development it is destined to undergo. Indeed, most of the principal eras in agricultural progress take their date from some improvement of the implements, or new application of machinery, affecting either the mode of cultivating the soil, or the treatment of the crops after they have been reared. The addition of a mould-board to the original plough, by which its principle of action was entirely changed, the alteration in its construction by which it became adapted to subsoil ploughing, the introduction of the thrashing-machine, of drills for both corn and root seeds, of the reaping-machine and the steam-engine, all mark important stages in the progress of farm operations due to the influence of mechanics upon them. The practical farmer and the mechanic have each stimulated the other to exertion; the one had only to explain his wants to have them readily supplied, and the ingenuity of the other often suggested contrivances for accomplishing more easily and effectually the object in view. Not unfrequently, indeed, the zeal and inventive skill of the mechanic have outstripped the wants of the farmer, and the number of implements, some of them of great ingenuity, that have become obsolete, is probably as great as of those in actual use. It is calculated to give us a very striking view of the extent to which the manufacture of agricultural implements has reached, as a great branch of national industry, as well as of the talent and ingenuity employed in it, that at some of the English agricultural shows, no fewer than two thousand implements have been exhibited, all of them setting forth special claims to attention, either for superiority of construction or originality in design.

In this, as in almost every other department of knowledge, art has preceded science, and agricultural implements, perhaps more than any others, have been fabricated without any adequate knowledge of the general principles on which their action depends. As the necessity of rearing articles of food was everywhere felt, so the requisite implements had to be constructed in some form or other;

* The *Book of Farm Implements and Machines.* By JAMES SLIGHT and R. SCOTT [illegible] Engineers. Edited by HENRY STEPHENS, Esq., Author of the *Book of the* [illegible] William Blackwood & Sons, Edinburgh and London.

and no wonder that they were often rude and inefficient, without regard to economising strength and labour. Originating, too, in many different quarters, at a time when there was comparatively little intercourse between places remote from each other, it is not surprising that they so often present endless diversities in detail, even when they agree in principle, or in the nature of the work they are intended to perform. In travelling through a country, we frequently cannot find a better means of judging of the degree of its provincial civilisation, or the condition of its rural population, than by looking at the state of its agricultural implements. It is surprising how rude they still are in many countries laying claim to a high state of social advancement; and our own country forms no exception to this remark. One familiar with the husbandry of the Lothians would be surprised at witnessing the agricultural instrumentation (if we may venture to use that word in a new sense) of some remote parts of the Highlands or Hebrides, and to see the *caschrom* and the thorn-bush substituted for the plough and the harrow. Wales and England still present similar barbarisms; and we dare not venture to affirm that in the sister isle, which always affords examples of things in the extreme, the notable Act against "a barbarous custome of ploughing, harrowing, drawing, and working with horses, mares, geldings, garrans, and colts, by yoking them by the taile," has in all cases become a dead letter. But in this country, science, although last to come into the field, has long continued to react upon practice; and in this department with such signal success, that the superiority of our agricultural implements and machinery is everywhere admitted.

They are distinguished for solidity of construction, simplicity of details, and economy in price, as well as for the rapidity and completeness with which they execute their work—especially that class of work which in other countries is more imperfectly and expensively performed by the labour of men or cattle. "As to our implements," said the Earl of Carlisle, in addressing an agricultural gathering of Yorkshiremen, "I saw on the plains of Troy the clod-crusher of Crosskill, the drills, the horse-hoes of Garrett, and the ploughs of Howard and Ransome." On the banks of the Danube, the Scheldt, and the Po, of the Mississippi and the Amazon, on the shores of the Baltic and the Black Sea, in the new continent of Australia, or in Flanders, the cradle of modern agriculture, English implements have the same preference as on the plains of Troy.*

And yet it cannot be affirmed that the progress of improvement in this department has been so rapid, nor the degree of perfection attained so complete, as has been the case in various other branches of art and manufactures. The agriculturist of the old school affected the character of being a type of stability, and, in order to be stable, he seemed to think it necessary that he should

* *Quarterly Review*, No. ccvi., p. 301.

be stationary; hence he was ready to regard every innovation on established practice with jealousy, and either silently to disregard or openly oppose it. Poverty, too, not unfrequently came in aid of prejudice; and to what extent the latter sometimes operated, it is not easy for us in the present day to form an adequate idea. We were at one time not unfamiliar with accounts of the destruction of machinery in manufacturing towns, under the mistaken idea that it was injurious to the artisan, and likely to throw many hands out of work. A similar delusion prevailed regarding agricultural machinery, and no doubt contributed to retard improvement. Nay, in regard to the latter, objections were raised by the more rigid sectaries on the score of religious principle, and it was thought unwarrantable "to work in the barn wi' a newfangled machine for dighting the corn frae the chaff, as it was impiously thwarting the will of Divine Providence, by raising wind for our ain particular use by human art, instead of soliciting it by prayer, or waiting patiently for whatever dispensation of wind Providence was pleased to send upon the sheeling-hill."* Such objections have long ceased to operate, and it is humiliating to think that they could have ever been for a moment entertained; but there are substantial reasons why machinery for agricultural purposes made slower progress, and fell short of the degree of perfection it so strikingly exhibited in various branches of manufacture. In the work of which we are about to give some account, these are judiciously stated, and they are in some respects such as would not occur to superficial observation. One circumstance conducive to this effect is, that all the important operations of husbandry are performed in *seasons*, occupying comparatively short periods of time; and should the artisan be endeavouring to produce any new or important machine, he can only make trial of it in the proper season. Thus, when Mr Bell had embodied his idea of the reaping-machine, he was unable to test its powers until he had created a kind of facsimile to a field of corn by sticking stalks of it in the earth. The imperfection of human perception, indeed, is too well known to leave us in surprise at the first attempt of any improvement turning out more or less a failure. The artisan, therefore, will in all probability feel that his project requires amendment; and before that can be effected, the season is past in which a second trial can be made, and, consequently, it must be postponed for a year, in the course of which many circumstances may occur to cause its being forgotten or abandoned. Impediments of this kind do not occur to the inventor or improver of manufacturing machinery, where constant daily opportunities may be found to test the successive steps of his invention.

One other general cause, and of another kind, exists, to supersede the

* *Old Mortality*, vol. i. p. [illegible]

necessity, or even the propriety, of employing machinery of such high and delicate finish as we see in the machines of all indoor manufactures; this is the irregularity of the media in which agricultural machinery is employed, and the numerous changes produced on these media, the soils and produce, by vicissitudes of weather and other causes, which not only affect the operation, but also the existence of many of these machines. From this cause, with its train of incidents, it may be inferred that agricultural machinery and tools must necessarily be of simple construction, which shall embrace nothing but the essentials of usefulness; that they have sufficient strength for their intended purpose, and free of any undue weight; that there should be no redundancy or misapplication of materials; that all materials employed should be of the best quality, and the workmanship plain and sound—which properties, it must be admitted, are of greater importance in agricultural machinery in general, than the minute delicacy of construction and finish observable in many of those almost intellectual tools employed in some of the other arts and manufactures.—P. 147.

But although our agricultural implements are unsurpassed or unequalled in their adaptation to the purpose in view, it must be admitted that the best kinds of them are by no means generally distributed. Almost every invention of importance has been made the subject of a patent, by which its price has been raised and its sale restricted. The best manufacturers are confined to a few localities, and there are many kinds of implements which cannot be obtained but from them, and at their own prices. Our country carpenters, smiths, and wheelwrights, have thereby been placed under great disadvantages, and, in general, it is only a few of the simpler implements they are in the habit of manufacturing. Their knowledge of mechanics as a science is, for the most part, not considerable, and they have scarcely any alternative but to follow the model put into their hands, whether its construction be good or bad. To all such parties, as well as to farmers and engineers, the work which we now proceed to introduce to our readers must prove an inestimable boon.

The Book of Farm Implements and Machines has been undertaken with the view of affording a full and minutely-detailed description of all the implements and machinery in actual use, either in the cultivation of the soil, or in the treatment of its produce. They are described with so much minuteness, accompanied with engravings, not only of the complete implement, but of the separate parts composing it, drawn to scale, that competent parties will be able to construct them without other aid than that here supplied. The rationale of their mode of working is explained, their relative value as to their applicability to the purpose in view tested both on mechanical principles and by actual experience, and historical notices given regarding their invention and the successive developments some of them have undergone. Nor is this all. A prominent feature in the work is to elucidate the scientific principles which regulate the choice of materials in

the construction of machines and implements, and to explain the laws of force and friction; in short, nothing is omitted calculated to give a full elucidation of the subject, and to render the work a complete repertory of everything essential relating to it.

A work of this kind, presenting so many excellent pictorial delineations, possesses, in one point of view, many of the advantages of an actual exhibition of implements, of which we have had so many of late years. It enables the farmer to take a deliberate view of the whole series, and select what is best fitted for his own purposes. He cannot travel about and visit different manufactories; and even if he could, he would be liable to be misled by the representations of interested parties. Here he is supplied with the means of judging and comparing, and is, moreover, aided by the opinion of competent authorities, who can have no possible bias in favour of one implement more than another, except what arises from the conviction of superior excellence. But, in another point of view, such a work does a great deal more than an exhibition of instruments: it gives an analysis of the mode of construction, it supplies the measurement of the different parts, shows the manner of combining them, and enters into details with so much minuteness, that, in most instances, an intelligent country wright and blacksmith will be able to fabricate the implements for the supply of their own neighbourhood. Nor does it stop even here; it follows the implements into the fields, points out the best mode of managing them, and criticises their work when it is completed. Nor will a work like this be of less benefit to foreign agriculturists. They are importing our machinery ready made at a great expense, whereas, by a directory of this kind, they will be enabled to make it for themselves. One of the results, both of this work and of the *Book of the Farm*, will be to produce a considerable degree of uniformity in agricultural operations in different countries; and the traveller may expect more than ever to meet with British implements, and see our own agricultural processes repeated, in foreign lands. The numerous Continental states that are reproducing, in translation,* the

* The first translation of the *Book of the Farm* was into German, by M. Eduard Schmedlin, published at Stuttgart by Hoffman, in 1855. The second was into the Hungarian language, by three different gentlemen, and began to be published in parts, at Pesth, in 1855. In order that the price might be so low as to bring it within reach of the Hungarian farmers, a public subscription was set on foot, by consent of the Emperor of Austria, to raise a sufficient sum to defray the expense of publication. This subscription was headed by the Archdukes Alrecht and Istran, and supported by 216 of the nobility and gentry of Hungary, among whose names is to be found that of the Duke of Saxe-Cobourg. In consequence of this arrangement, the work was sold at 6 florins, or 10s., to the farmers, of whom no fewer than [illegible]000 availed themselves of it. There is a translation into Swedish; and various separate portions of the work have been already published in French, while a translation of the entire work into the same language is in course of preparation. Last year a German translation of Mr Stephens's Catechism of *Practical Agriculture* was published at Leipsic.

k of the Farm, will doubtless soon perceive that it is their inte- to add to it the present work, as a most valuable companion.
Iany interesting and important experiments have recently been le on a subject which formerly attracted but little attention; ıely, the materials employed in construction, whether stone, , or timber. The object has been to determine their dura- ;y, power of resistance, and other properties, and also the hods best calculated to make them withstand the effects of sture and the vicissitudes of the weather. They are of greatest rest in reference to timber, which suffers most from these causes, a variety of methods are here detailed, which are more or less ;tive. The due seasoning of timber, whether natural, by sim- drying, or aided by art, as in water-seasoning and hot-air ccation, is of an importance which cannot be over-estimated, ought to receive the utmost attention from the machine and lement maker. When the timber has to be stationary, and er under cover or exposed to the weather, it is recommended ; it should undergo some Kyanising process, of which there are ›ral, which seem to accomplish the purpose with an almost equal ree of efficiency. It is well known what great advantages have ›n from the extended use of malleable iron in almost every ety of construction, and in no department has it been more eficial than in that of farm implements. In elegance of ap- rance, durability, and efficiency, the gain has been very great; it is not improbable, if iron should be cheap, that it will be stituted in many other instances where wood is now employed. various forms in which iron wire is now used on farms is com- ıtively a new feature; it is well fitted for many other purposes ı those for which it has hitherto been adopted.
'he term implement is occasionally used to denote every kind ;ool or machine employed on the farm, although in many ances it is not very applicable. A *machine*, strictly speaking, combination of mechanical powers, so constructed as to be in ·ly all things self-acting, put in motion by a moving power, ıiring from man little more than is necessary to regulate it, and ›ly it with the material on which it operates. The more com- ely, therefore, we can make a machine do its own work, and ıst itself to its own requirements, the more completely are we d from the necessity of employing skilled labour, and the ıper, consequently, can we do our work. Provided we can get k enough for our machine to do, it is cheaper to construct an ›nsive machine to do its work with only unskilled, than to em- ' less perfect mechanism necessitating the employment of skilled ›ur, which is always more difficult to be obtained than unskilled. *implement*, on the other hand, is more completely under the ;rol of the workman, being either entirely or in part worked ıis own strength, and may therefore, and in general does, de-

mand the exercise of skill on the part of the worker to enable it to meet the peculiarities of a soil or crop constantly varying in character.* A good deal of the furniture (if we may so speak) of a farm obviously does not fall very appropriately under either of these categories; but no inconvenience in practice can arise from this looseness of nomenclature.

Of the implements connected with the cultivation of the soil, the plough demands the first attention, whether we regard its importance in the operations of the farm, the beauty of its mechanical construction, the services it has rendered to husbandry, or its historical associations. Though destined, we cannot help thinking, to be ere long more or less superseded, it will never cease to be an object of interest. In the work before us it is treated of at great length, and an account more complete and satisfactory, in every light in which it can be viewed, has not previously been laid before the public. It would of itself suffice to form an ordinarily-sized volume, and one of no common interest and value. We have recently had occasion, in this Journal,† to touch on what may be called the ancient history of the plough; it may be interesting to say a few words regarding the more recent changes and improvements it has undergone. Up to the beginning of the last century it continued, in Britain, in a very rude and uncouth state, and it was probably even worse elsewhere. About that period agriculture became more an object of attention; draining began to be introduced; and the improved condition of the soil arising from that operation, called for better modes of cultivating and dressing it. Attempts were accordingly made to improve the plough, and one was introduced into the northern counties of England under the name of the Dutch or Rotherham plough.

This (say the authors of the present work) appears to be the foundation of all the modern improvements, and from the circumstance of engineers and mechanics having been brought from Holland to conduct the draining of the English fens, there is good reason to conclude that the Rotherham plough was originally an importation from Holland, in a similar manner as the barley-mill was, at a later period, borrowed from that country. About the middle of the past century, the Rotherham plough appears to have been partially introduced into Scotland; but until James Small took up the subject, and by his judicious improvements gave a decided character to the plough, little or no progress had been made with it.

Small appears to have been the first who gave to the mould-board and the share a *form* that could be partially imitated by others, whereby, following his instructions, mould-boards could be multiplied, each possessing the particular form which he had directed to be given to them. It is to be observed that when Small first taught the method of construction, mould-boards were really *boards* of wood, and, for their defence, were covered with plates of iron. The method of construction not being very clearly defined, and mould-boards being necessarily constructed by many different hands,

* See page 2[illegible]

† No. LIX., p. 187.

the improved plan, it may be easily conceived, must have been liable to failure in practice. It was therefore one of those happy coincidences which now and then occur for the benefit of mankind, that the founding of cast-iron was then beginning to become general. The fortunate circumstance was seized. Mould-boards, together with the head or sheath, and the sole and landside plates, were made of cast-iron; and a model or pattern of these parts having been once formed, any number of duplicates could be obtained, each possessing every quality, in point of form, as perfectly as the original model. The plough, thus in a great measure placed beyond the power of uninformed mechanics to maltreat, came rapidly and deservedly into public esteem under the name of Small's plough. Though originally produced in Berwickshire, the plough that seems to retain the principal feature of Small's improvements—the mould-board—is now found chiefly in East-Lothian, and differs very sensibly from that now generally used in Berwickshire.—P. 149.

Much about the same period other improvements were adopted, particularly in regard to the construction of the mould-board, of which that proposed by Bailey of Chillingham is mentioned with most approbation. The wooden framing existed universally till about the beginning of the present century, when malleable-iron first began to be used in its fabrication. The advantages attending this change were so great, that it was gradually more and more generally adopted, till it is now, in Scotland at least, all but universal. Its principal advantage is its great durability, resisting uninjured the influences of the weather, and the shocks to which the implement is liable in the course of working, under which we have oftener than once seen a wooden beam fractured and rendered useless in an instant.

This period was also productive of an innovation on the form of the mould-board and share which had been established by Small. The mould-boards hitherto referred to came under the denomination of concave, or, more properly, straight-lined; when Wilkie, of Uddingstone, near Glasgow, introduced his new form with convex lines, and which has been adopted in various districts in Scotland, to the exclusion of the concave form.

These two forms, the *concave* and *convex*, have undergone numerous slight changes, forming sub-varieties, but retaining the respective leading features of the concave and convex mould-boards; and as they have each spread (especially the first) over a wide extent of country, they may be distinguished by the county in which they are chiefly employed. Thus, the Small's plough is used in East-Lothian, and Wilkie's in Lanarkshire. —P. 150.

Much controversy has been carried on respecting the comparative merits of swing and wheel ploughs. The latter have found little favour in Scotland, while the former have met with a similar fate in England. Opinion, however, seems to be on the turn, and we should not be surprised to see wheel-ploughs come into frequent use in Scotland. It seems to be undeniable that they make best

work with inexperienced ploughmen, being much more easily guided; and in all cases the work appears to be more uniform in furrow-slice, and especially in depth of furrow. It is alleged, too, and with considerable appearance of truth, that they are of easier draught than swing-ploughs, and their comparative exemption from those vibrations, violent twistings, continual elevations and depressions, which take place with the other implements, must render them much easier, not only to the ploughman but to the horses. It is further stated in their favour, that in land made hard by drought or other causes, they will make good work, when the rival implement will either not work at all, or most imperfectly, and with great exertion both to man and horses. If there be any truth in the objection that the ploughs in question are inferior in working cloddy ground, in crossing steep ridges, or in making drills, this is at once removed by the fact that they are so constructed that the wheels can be removed at pleasure, and these exceptional cases at once provided for. The strongly-divided opinion on this subject is probably owing, as is here remarked, to the advocates of these respective implements having witnessed them at work mostly on different kinds of ground. There must necessarily be one class of soil in which the one is better fitted to do the work than the other. Whenever a soil approaches to the character of uniformity, the more closely the implement operating upon it can be brought to the condition of a machine—that is, self-adjusting, and requiring little exercise of mind or exertion of body on the part of its attendant—the more economically, and, *cæteris paribus*, the more perfectly will it do its work. In such cases the balance of circumstances is in favour of wheel-ploughs. On the other hand, it must be conceded that in some districts, and in Scotland generally, the soil is so crude, unsteady, and unequal, that some exercise of skill and forethought on the part of the attendant is imperatively demanded before the plough can do its work well; in such cases the balance of circumstances is in favour of the swing-plough.

Now, it will be pretty generally admitted (we think we may venture o say that we are quoting the words of the editor), that, as a rule, the soil ossessing a uniformity of character is more frequently met with in England han it is in Scotland, where the unequal soil is prevalent. May not this ircumstance give us somewhat of a clue to the reason why, in England, vheel-ploughs are such favourites—the swing an equal favourite in Scotand? It certainly seems to us that this is a more philosophical way of ccounting for the difference of opinion than that generally received, which ttributes it to mere prejudice—one mutually held by English and Scotch griculturists. Prejudice may sustain its power for some time, but when t[illegible]intenance is found to be at the expense of time and money, it soon [illegible] its force and influence. A statement may be here permitted, and one ch is pregnant with meaning, namely, that the opinion of Scotch agri-[illegible] to wheel-ploughs, is fast

becoming modified, and that they are being introduced successfully into practice. May not this arise from the circumstance that some soils, through superior culture, have assumed that uniformity of character which enables the wheel-plough to be worked where, in times gone by, it would have been found almost inoperative? Indeed, we may state it without hesitation, that as long as the soil contains a large proportion of loose though even small stones, there the use of the wheel-plough is impracticable, and the swing-plough implement is required to wend its way through them by skill, and not by mere force. On the other hand, smooth soils are just the medium for the exercise of the wheel-plough machine.—P. 222.

We cannot say, from our own observation, whether this explanation, in itself so judicious and rational, is corroborated by what takes place in foreign countries, where cultivated land occurs equally adapted to both implements; but from the general unskilfulness of foreign ploughmen, we should suppose that the more easily managed wheel-plough will be most in request.

The authors, as has been stated, devote particular attention to all that relates to the plough, and from their descriptive details, even when so minute as to be intended chiefly as a guide to the constructor of these implements, there continually emerges matter of practical and more general importance, calculated to enlighten the farmer as to his field operations. Of this nature are the remarks on rectangular and crested furrow-slices, peculiarities arising from modifications in the curve of the mould-board. Crested-furrow ploughing has become fashionable, as the high surface-finish is most agreeable to the eye, and seems to indicate perfection of workmanship: in reality, however, it is shown to be defective, and undeserving of the preference it has obtained over the older practice. Ploughs producing such a furrow are of heavier draught than such as produce a rectangular furrow; there is a loss of time and labour in the comparative narrowness in the furrow-slice, as well as other disadvantages. This view of the subject leads to the following remarks on ploughing-matches, which are well worthy of attention:—

While we offer our ardent wishes for a continuance of the means which have raised the character of the Scottish ploughmen, we cannot prevent doubts rising in our mind, that, however good and beneficial these competitions are calculated to be, if the exertions of the class are properly directed, yet the best exertions of both the promoters and the actors may be frustrated by allowing a false taste to be engendered among the operatives. That such a false taste has taken root, we have no doubt; and the results of it are appearing in the spread of opinions favourable to that kind of ploughing which to us appears not much deserving of encouragement—the high-crested system. We have observed, at various ploughing-matches, that the prize was awarded to that kind of ploughmanship which exhibited the highest surface-finish, without reference to the groundwork of it; and we have compared, by actual weight, all crumbs included, the quantities of soil lifted by ploughs that gained prizes with others that did not, because their

work did not look so fine on the surface; and we have found that the one to whom the prize was awarded had not lifted so much soil by $\frac{1}{10}$ as some of those that were rejected. We are far from intending, by these remarks, to throw discredit on ploughing-matches; on the contrary, we would wish to see them meet with tenfold encouragement, and also to see many more than are usually met with, of the good and the great of the land, assembled at these meetings, to encourage and stimulate by their presence and liberality the exertions of the competitors in such useful and interesting exhibitions. —P. 173.

Steam-ploughing—that is, the application of steam-power to work the ordinary plough, or some other implement constructed on the same principle—must now be regarded as a fact accomplished: steam-cultivation—that is, the culture of the soil by some other method of employing steam-power—is still in the region of speculation and conjecture. Of various contrivances having the first of these objects in view, some are already forgotten, others are passing into oblivion, and such as still keep the field enjoy but a very equivocal degree of favour. They have sufficiently demonstrated the practicability of the object; but neither the nature of the work, nor the economy attending this mode of executing it, have been such as to command anything like general adoption, or at all to satisfy the expectations which have been formed from the motive agent employed. The Marquess of Tweeddale's system of steam-ploughing, and that of Mr John Fowler, are probably the most successful; the latter, in particular, has been kept much under the public eye, and has attracted a considerable degree of public attention. Both these systems are here described at length, and every requisite detail for the first time supplied. A communication has been furnished by Mr Fowler to the authors of the present work, on the economy of steam-ploughing as compared with horse-labour; and as this is the point of view in which the agricultural interest is most concerned in his invention, we give it in his own words:—

In our experiments we have used engines of from eight to ten horse-power—that is, marketable horse-power, giving off more than double the horse-power they are sold by. The first thing to be ascertained was the speed at which the plough should travel, as of course the higher the speed the less the strain upon the tackle; and our experience has shown that a speed of about 300 feet per minute, or something less than $3\frac{1}{2}$ miles per hour, is about the best speed for general purposes. At this pace every effective horse-power gives off 110 lb., say 1 cwt. draught. When we consider that in ploughing the different classes of land, a draught of from 2 cwt., as in Norfolk, up to 8 and even 10 cwt. in the clay land of Kent, is required for each furrow, it will be seen that it is impossible to form deductions from the mere fact of ploughing an acre of land; but assuming, what experience has proved, that a horse in good condition will travel the eleven miles required to plough one acre, giving off a draught varying from $1\frac{3}{4}$ to 2 cwt., and that if we increase the draught we must decrease the number of miles

travelled, we have some clue to guide our comparison. The experiments show that, at the speed of $3\frac{1}{2}$ miles per hour, $1\frac{1}{2}$ acres can be done by each furrow in a day of ten hours, in a field of 250 yards long, and 2 acres in a field of 400 yards long, allowing for hindrances. Now, if we assume the use of an engine giving off not less than 24 nominal horse-power, of which about 4 horse-power is consumed in friction, the remaining 20 being given off in work in the plough equal to 20 cwt. draught—thus drawing three furrows or shares four-horse work each, four furrows three-horse work—we shall then get over from $4\frac{1}{2}$ to 6 acres of the heavier work, and from 6 to 8 acres of the lighter work. If the land is lighter than either of these, less horse-power will be used; and in consequence of less hindrance, and the engine running always at top speed, an acre an hour can be easily accomplished. The daily expenses are as follows:—

	s.	*d.*
Two men at 3s.,	6	0
Two men at 2s. 3d.,	4	6
One boy at 1s.,	1	0
Coals, from 10 to 12 cwt.,	14	0
Water, one horse, and man,	6	0
Shifting, 24s. per week, or	4	0
	35	6

	$4\frac{1}{2}$ acres.	6 acres.	8 acres.
Cost per acre, exclusive of wear and tear, respectively,	7s. 11d.	6s.	4s.
As against	16s. 0d.	12s.	9s. by horse labour.

Of rotatory steam-cultivators, on which the highest praise that can be justly bestowed is that they are not just entire failures, the two principal are here described—that of Usher, and that of Romaine. They have the mérit of having adopted a new principle, and entered an untried field of experiment, where success will probably be the result, not so much of one happy idea, as of an accumulation of observations and dearly-purchased experience. They may have the consolation of reflecting, therefore, that though they have in some degree failed, it may be said of each of them,

Magnis tamen excidit ausis,

and that they will probably have many others to share their lot. No approximation has yet been made to what steam is expected to do for agriculture, when proper means are devised to give full scope to its powers. It has a giant's strength, and is expected to use it like a giant. What has hitherto been done may be regarded as useful chiefly in a tentative point of view, as exploring the way, and preparing for higher achievements; and the end may be gained after many failures, and even partly by their means, as pointing out errors to be afterwards avoided.

The other implements connected with the cultivation of the soil are next passed successively in review, and a consideration bestowed on them suitable to their respective importance. The grubber—an instrument of comparatively modern introduction, at

least in its present form—is now extensively used, and found to be of very great utility. It seems to have sprung from the more ancient prototype, the brake-harrow, which it has now in a great measure superseded. Although known long previously, it received little attention till it was again brought forward in 1811 by Sir John Sinclair, under the English name of the *scarifier*. It then seems to have been imported from England, but was soon greatly improved in Scotland, and it is only very recently that its newest forms have appeared in the sister country. As happens with many novelties, its merits were, on its reintroduction in 1811, greatly overrated, and it was held up as an implement capable of producing an entire revolution in the cultivation of the soil—as something, in fact, above human invention, superseding even the plough. It has long since settled down to its proper sphere of usefulness, which still ranks it next the plough.

The various kinds of harrows, rollers, and horse-hoes next claim attention, and the extensive family of drills and sowing-machines succeeds them. The degree of perfection many of these implements have attained is such as to leave scarcely anything to be desired, and they exhibit such variety of construction as to suit at once the object and means of all who require to use them. While they perform their work with a precision which no manual labour could compete with, the saving of seed and economy of manure by drill husbandry are very great; and by permitting the use of the horse-hoe, the amount of labour saved is incalculable. It is estimated that a horse-drill does the work of fifteen men. Their principle of action and mode of construction are here explained with that fulness and precision which is maintained throughout every part of the work.

The description and history of reaping-machines, which have of late occupied so much of the public attention, form a very interesting portion of the present volume. The importance of a rapid, effective, and economical method of reaping the corn-crops in harvest, the most engrossing event of the agricultural year, and the reward of all previous exertions, early drew a number of competitors into this field of invention, and they form a more lengthened catalogue than would generally be supposed. Nearly all of them, however, are now forgotten, although more than one of them were of considerable promise. That of Ogle and Brown, for example, invented about the year 1822, presents almost a perfect sameness, in every point, with one of the American reapers, M'Cormick's: the similarity is so perfect, that the description of either would suit equally well for the other. Such coincidences, however, though curious, are said to be not uncommon among mechanical inventions. The only implements of this description, however, which have been completed, and some of which may be regarded as having accomplished the purpose aimed at, are only

five in number—namely, Smith of Deanston's, Mann's, Bell's, Dray's Hussey's, and M'Cormick's,—the three latter alone having come into actual use. Bell's machine is now well known, and may be said to have taken its place among the standard machines of the farm. It, as well as the others, are described here at length. In regard to economy, the recommendation is strong. The expense of using it will of course vary a little with the rate of wages, for fourteen labourers are required, besides the driver of the horses, whose time reckons along with them. The work performed averages 12 imperial acres per day. The average rate of expense may be taken at 3s. 6d. an acre, including the expense of food to the workers. This, in round numbers, may be taken as a saving of one-half the usual expense of reaping by hand, at the lowest calculation; and the saving on a farm where there might be 100 acres of cereal and leguminous crops would do more than cover the price of a machine of the best quality in two years. In these circumstances it appears surprising that this machine is not more generally used than it is, for there is the best authority for saying that it possesses some points of excellence not shared by any other, and its merits have now been sanctioned by the experience of fourteen years. It is an instance of the extreme slowness with which people change long-established habits, even when it is greatly to their interest to make that change. The considerable outlay also, in the first instance, in the purchase of the machine, will in many cases operate against it.

The thrasher and the flail, not many years ago to be met with on every onstead, and on a winter day one of the most pleasing and characteristic sights and sounds associated with such a spot, are becoming as rare a spectacle as that modern phenomenon, a stage-coachman, and for the most part from the same cause, the influence of steam, that great alterative in so many departments of our social system. Thrashing-machines are perhaps the most perfect of all the mechanical inventions employed on the farm; and it is interesting to observe the various gradations through which they have passed before reaching their present state, when, by the addition of certain barn-machinery, all put in action by the same moving power, they execute a series of operations alike beautiful and admirable.

The portable English thrashing-machines first made their appearance in 1842. They came rapidly into favour, and are now very general in England, and not unfrequent in Scotland. In a single year one firm alone sent out no fewer than five hundred engines, on an average of seven-horse power. These machines admit of entirely new modes of management in the economy of the farm. In outlying fields and remotely-detached portions of the farm, as well as in ground of a hilly and difficult character, instead of carrying the crops to the machine, we can take the machine to the crops, and thrash out the corn on the spot; and it will even be an advantage,

in many cases, to convey cattle thither also, and convert the straw into manure. In this way a very great saving of labour may often be effected. In the portable combined thrashing-machines, now also so much used and so favourably known in England, the operation of dressing and separating are combined with those of thrashing and winnowing.

Considerable diversity of opinion prevails in this country regarding the respective merits of the English and Scotch thrashing-machines. The subject is often introduced in public discussions, and it seems difficult to obtain satisfactory grounds of decision. In these circumstances, it will be gratifying to our readers to hear the opinion of the authors of *The Book of Farm Implements*, which we accordingly extract:—

Scottish farmers seem already convinced that the beater or drum of the English machine takes the grain more cleanly from the straw, breaks the straw much less, and thrashes out a larger quantity of grain in a given time, than the Scotch machine. Thus far the English machine affords decided advantages. On the other hand, it has been found that the English machine indents or mutilates the grain itself, especially new or unwon wheat, and even destroys its vitality. It is believed that if the downy substance at one end of the grain of wheat be taken away, the grain loses its vitality. It is quite possible that the quick sharp stroke of the English beater may actually injure the grains of wheat, and so may those beaters which rub out the corn from the straw; but one can hardly suppose that either the beating or the rubbing of the English drum could remove the downy substance from the grain; so that, if the vitality of wheat is really affected by the English machine, it must be so by the hummeller within it, which seems to us to endeavour to do too much in the way of cleaning the grain by a thrashing-machine. It is well, indeed requisite, that a thrashing-machine should take the grain from the straw, and divide the grosser impurities of chaff and roughs from the grain; but a question may reasonably be raised whether the grain should be cleaned to the degree fit for market by the thrashing-machine. For our part, we have never yet seen a thrashing-machine that cleaned the grain as it should be for market, according to our judgment of cleanliness; and, in our opinion, the English machines attempt too much, and run the risk of injuring the grain. Now, the Scotch machine, by its slow motion, never injures the grain, and few attempt to clean it for the market; but the cleansing process by the Scotch farmers, and the hands of women-workers, is perfect and innocuous. The improvement which we would therefore desiderate in Scotland in the thrashing of grain, is the adoption of the high-speed English beater to the degree of not injuring the grain, with a combination of the most perfect Scotch cleansing process. Under such auspices the grain would escape injury, and be perfectly cleansed to the degree to insure its vitality. It is the true object of the farmer to preserve the vitality of the grain he sells, that it may be sold alike to the farmer to be sown, or to the miller to be ground. If the miller finds that the farmer's extent of cleansing does not suit him, he must himself prepare the grain for his own purpose; but the farmer, for his own interest, must on no account adopt any process that will deprive the grain he has to sell of its vitality.—P. 396.

After the consideration of the smaller implements of the farm, not one of which, whatever rank it may hold in the scale of importance, fails to receive its due share of attention, an important section of the work is devoted to the moving powers of the farm—under which water-wheels, and the various agricultural steam-engines, are considered—and the volume appropriately terminates with directions for the arrangement of machines in the steading. Into the consideration of these departments of the subject, however, our space does not permit us to enter. What has been said will, we trust, suffice to convey some idea of the nature and value of *The Book of Farm Implements.* And yet we have touched only on its more general views, without exemplifying its special character. Its great merit consists in the fulness and minuteness of its descriptive details, which require to be deliberately studied in its own pages, rather than cursorily perused in any condensed abstract which could be given in this place. These descriptions are free from all unnecessary technicalities, written with great clearness and distinctness, while the profusion of illustrative figures and diagrams renders them readily intelligible even to those least accustomed to turn their attention to such subjects. We have not, indeed, often met with a work which so faithfully, thoroughly, and satisfactorily accomplishes the object it has in view, or which evinces so much general knowledge combined with the most laborious and painstaking industry. As such it cannot fail to be regarded as a great boon to agriculture. Mechanics must ever be the right arm of husbandry, and the more completely they become its handmaid, the more assured will be its prosperity. This work places before us, and enables us to form an intelligent opinion of, those mechanical productions which have rendered British agriculture a model to other nations. By pointing out what is deserving of commendation, as accordant with sound mechanical principles either in design or construction, it goes far to secure us against retrograde movements, which have often been made in this department; and by showing what is defective, it indicates the path to further improvements. One of its results, we have no doubt, will be the manufacture of a better class of implements in parts of the country where they were previously little known; and nothing is better calculated to raise and equalise the whole character of our agriculture, than a general diffusion of the best means of performing its operations. Whenever a farmer has experienced the advantages even of one superior implement—its saving of time and labour, the rapidity, accuracy, and efficiency of its work, and the ease and comfort to those who use it—he will never relapse into his former indifference, but will seek to obtain similar benefits for every department of his profession.

NOTES TAKEN DURING A TEN DAYS' SOJOURN IN THE SHETLAND ISLANDS.

A DESIRE to have the benefit of the bracing air of the northern surges, and perhaps the not less potent one of traversing the regions which the genius of Scott has rendered classic, and round which hovers a delicious atmosphere of historic mystery, carrying us back to the days of the sea-kings, and bringing us within hearing of Icelandic Sagas, induced us to avail ourselves of an opportunity to visit the remote regions of the north, the *Ultima Thule* of the ancient Romans. Nor was the consideration altogether powerless, that we might possibly pick up something which, viewed by the light of experience of sunnier skies and more favoured climates, might be interesting to the readers of this Journal. Altogether, however, the various considerations speedily narrowed the debatable land between "shall we?" and "we shall;" so that within a very few hours from receiving at Manchester the notice of our friend, who was to accompany us, as to route and time of departure, we found ourselves landing at one of the quaint quays of the quaint old town of Lerwick.

The Shetland Islands, of which this town is the capital, are ninety in number, extending over a space some 70 miles from north to south, and 54 from east to west. They are of all sizes, from the islets or "holms" of a few square yards in extent, to the largest of the group, the "Mainland,"—on the eastern side of which lies the town of Lerwick—the length of which is 55, and breadth 25 miles. Twenty-five out of the ninety only, are inhabited, the rest being pasture islands.

The Shetland Islands, it is supposed, were visited by the Romans, and were by that people considered as the end of the world. In an after period they were taken possession of by the Northmen, who [illegible] them— [illegible] ppears from the Icelandic Sagas—Hialtland, [illegible] ofty land; a designation which is specially [illegible] eir precipitously picturesque shores. From [illegible] ne modern name of Shetland, and still more [illegible], rendered classical by Scott.

[illegible] y words to convey any correct notion of the [illegible] ugged scenery of the coasts. Broken up by bays [illegible] rmed—from whence the Danish rovers were [illegible] y-kings—many of which stretch far into he interior of [illegible] forming safe and capacious harbours, the ntrances [illegible] hich are guarded by bold promontories and towering [illegible] margins, fringed by rocks, exhibiting in their [illegible] antastic [illegible] and the mighty power of the

waves which lash them, they afford an endless variety of objects, grand and picturesque. The interior land is remarkably varied in character, but presents chiefly a bleak, moorland, uncultivated appearance. Some of the vales require only the green hue of the trees, and the smiling tints of the sun, flashing them into gorgeousness, to make them altogether lovely; but the "beauty of the wooded dell," and the "wave of trees," are things not granted to these northern regions, neither is there much of sunlight; although, in justice, we are bound to say that we had plenty of it during our stay; for finer, more joyous weather, we could not have had. Indeed the islands have not been blessed with such a summer since 1834.

From this it will be seen that the climate is not propitious to the progress of agriculture. It is "moist and variable, rarely presenting great extremes of temperature;" and the islands are from time time devastated by gales which, blowing fiercely in a way of which southerns have no conception, and before which men nor cattle can scarcely make head, blast, at autumn time, in a few hours, all the hopes of the husbandman. Mr Penney, a Bressay farmer, informed us that a beautiful field of barley which he had one season, ready for cutting, presented, after a few hours of a north-east gale, nothing but the straw, the whole of the grain being swept off nearly as clean as if the grain had passed under the action of the flail or the thrashing-machine.

Of the geology of the islands little needs to be said. The rocks are all of the primitive formation, and, from the different species existing, contribute much to the varied character of the interior, to which we have already alluded. Lime is met with in different localities. Burnt in rude kilns, it is used chiefly for building purposes, rarely employed in agriculture; to which, from the crude sour nature of the soil, it would be particularly valuable. Sandstone slate is met with in abundance, and, used for roofing, gives, in conjunction with the stone of which the walls are built, that peculiarly cold, grey, and lifeless appearance which the "towns" of Shetland exhibit. Coal is nowhere met with; but peat, providentially abundant, supplies its place.

The soil of Shetland may be generally described as light and mossy, exceptional cases arising from the nature and manner of exposition of the underlying rocks. In many of the valleys along the margin of the inland lakes, and the shores of the sounds and bays, alluvial soil is met with, much of which, by long cultivation, is now in fine condition, and, by the introduction of a superior mode of working, would yield satisfactory results. The mossy soil often met with is capable of being much improved, by the use of lime in the state of carbonate, as it adds carbon as well as neutralises the acids.

The tenure of land is peculiar. It is possessed by the *mark*.

"The word signifies, in the Norse dialect," says the *New Statistical Account*, to which we are indebted for much valuable information, "a coin, a weight, a field, and in the present case it may be translated a *share*, or proportional quantity of land. Shetland contains about 14,000 *marks*; and a proprietor is said to be a laird of so many marks, not acres. All the land, with the exception of the small grazing fields, was anciently divided, as it still remains, into districts of unequal extent, termed *scattalds*, and the boundary lines of each defined and recorded. Each of these contained a certain number of marks, some greater and others less. The marks or shares, in any one scattald, are of equal value, though they may be very different as compared with those of another; for one district, containing 200 marks, may be less extensive and valuable than another containing 100. In the event of dividing a scattald possessed by several proprietors, each receives his proportion according to the number of marks or shares in it which his rental bears. These scattalds are again subdivided into first, enclosed and appropriated; and, second, unenclosed and unappropriated ground. The former contains the arable, grass, and meadow lands, which bear a very small proportion to the unenclosed or commons."

Long leases are not common; and although the absence of these has frequently been represented as a grievance under which the tenant suffers, still we believe that leases are not desired by the tenants themselves, and if wanted would be easily obtained.

"A more immediate and direct benefit," says a writer in the *New Statistical Account*, "would be produced were the landlords, instead of attending chiefly to the extension of their properties, to employ a part of the time of their tenants for hire, in improving the farm, by enclosing, draining, manuring, collecting, spade-trenching, &c. (opening with the mattock the subsoil, but leaving it *in situ*, as I have practised for several years); thus at once permanently raising their value, benefiting the tenants, and inuring them to regular and useful land-labour. For instance, at a small expense each cottar could enclose such an extent of ground as might raise so much ryegrass and turnips, from seed of his own growth, as would enable him to keep annually an additional cow, and do ample justice to all the rest of his live-stock; and if this simple expedient alone were universal, the rental of the whole country would soon be greatly increased. It may be affirmed that, by this and other simple and economical improvements, on which our limits will not allow us to enlarge, and by more persevering industry, the lands under cultivation might be rendered much more productive, without conflicting with the general habits and nature of the people; and such graftings on the old system are confessedly to be preferred to uprooting and extensive innovations, which too often are found to rest on nothing but the love of novelty and generalisation."

The chief town of the Shetland Islands is Lerwick, to which place the visitor is booked by the steamer.* It is the most northerly town

* A fine new paddle-wheel steamer, the "Prince Consort," built expressly for the station, plies once a-week between Granton and Lerwick. It makes the passage in from thirty-six to forty-eight hours, according to the state of the weather. It has excellent cabin accommodation, and is commanded by as frank and pleasant a captain—Mr R. Parrott—as ever trod quarterdeck.

in her Majesty's dominions, and is situated on what is called the Mainland. Its position is striking enough. It stretches in crescent form along a sloping shore; and the houses rising one above the other, terrace-like, with their gables chiefly turned seawards, its appearance is picturesque and pleasing. From many of the houses quays of rough hewn stone project into the sea, and by means of boats, of which nearly every family has one, or at least owns a share in one, communication is kept up between one part of the town and another; the streets, or rather lanes and alleys—for we cannot dignify them with the former name—being so narrow that no traffic in the conveyance of goods can be carried on in the interior of the town. The main lane follows the contour of the bay, while, diverging at all angles, run off subsidiary lanes, leading to the higher parts of the town or to the quays. The sea at many of the houses is so deep that the foundations, and even some of the lower apartments, are below the water-line. Notwithstanding the contiguity of the houses to the water, and the unprotected state of the quays, frequented as they are at times by children, comparatively few accidents happen. Our boatman told us of one little girl who, going down one of the many steps leading to the sea to procure a vesselful of water, fell in and was drowned, neither girl nor vessel being ever found; and it was hard to tell, from the boatman's manner of narrating the circumstance, whether he considered the failure to recover the vessel as great a calamity as that of the attempt to recover the body of the little sufferer,—crockery, doubtless, being a valuable commodity in the islands. From the frequent use of boats, necessitated by the peculiar arrangements of the town, it may be supposed that the inhabitants are all expert in their management. The women handle an oar with all the dexterity of experienced hands; and little skiffs may be seen studding the waters of the bay, the oar pulled by the tiny hands of children; and now and then a more than usually adventurous party of youths raise the sail, an exceeding small boy taking the rudder with infinite ease of mind. Although the bay is completely land-locked, still from the hills of the island of Bressay, which is opposite Lerwick, breezes come suddenly down, which roughen the water into dancing life, and render skilful management of your craft somewhat necessary, so that we incline to wonder that accidents are not more numerous, for, like all seafaring or fishing populations, a capability to swim is the exception, not the rule amongst the inhabitants. The boats are on the model of the true Norwegian yawl, pointed and rising at both ends, and in consequence depressed in the middle. They are as safe at sea as they are swift, and, carrying large sail, can make a rare run with a good wind.

In connection with the quaint old town of Lerwick, we have still to notice Fort Charlotte, which commands the harbour, and could, circumstances being favourable, effectually protect the buildings from any external attack. We say circumstances being favourable, for at

present such is the rickety state of the walls, that, whatever damage a discharge of artillery might do from its tottering ramparts amongst invading foes, the damage to the ramparts themselves would not, we opine, be trifling. At present there is no likelihood of this being tested; for although we wandered amongst "magazines" and "gun-rooms," "canteens" and "mess rooms," they gave shelter to no soldiers—an honest Glasgow sergeant representing, in his own noble soldierlike person, the whole of the garrison.

The inhabitants are exceedingly quiet and gentle in their manners, obliging to strangers, and withal most hospitable. We marked with pleasure a wonderful absence of intoxication, at least of that brutal kind which greets the stranger in most of our large towns. We could discover no house solely devoted to the sale of drink; and it was with not less pleasure that we remarked the absence of all gross and debasing talk on occasions which might have somewhat excused it, and which in other seafaring towns would have called forth volleys of oaths and slang.

There is capital fishing in the bay, and in the evenings boats may be counted by the dozen lying off the entrance. From the rapidity with which the fish generally take the bait, less exciting amusement may be followed than fishing for an hour or two in the quiet beauty and stillness of a Shetland summer evening. The fish generally obtained are small rock-cod, haddocks, and the young of the coal-fish, which in their first year are termed *sillacks*, and *pillacks* in the second and third years. These are taken in amazing numbers, afford good eating, and are wholesome and nutritious. The deep-sea fish, as skate, turbots, &c., are very fine, and extremely cheap.

Early in the morning of the day after our arrival—for time was short, and we had much to see—we had ponies of the real Shetland breed waiting at the door of our lodgings—for there is no inn or hotel, properly so called, in Lerwick—to carry us across to Scalloway, a small town—a single house in the country districts is called a town—a few miles to the west of Lerwick. Scalloway is beautifully situated at the head of a bay, and the country lying between the two towns affords the stranger an opportunity of noticing the peculiarities of the soil, the mode of agriculture here and there practised, and the quality of the "stock," which pick up a living from the herbage, exceeding scanty. In leaving Lerwick, and proceeding by the new road formed by Government aid in the time of the famine, we saw in the bared rocks, lying thick in the surrounding moss, evidences of the demand which the increasing population had made on the fuel there obtained; for by continued digging the upper strata of peat had been entirely removed, laying bare the boulders, &c., beneath; and a curious contrast was thus presented by the white rocks, which glistened in the sun, and the dark setting of mossy land by which they were surrounded. As we rode on we met numbers of women, none of them particularly distinguished by

good looks, bearing burdens of moss to the town, which might have made a Liverpool porter stagger, yet busily engaged in knitting as they trudged along, generally in groups, gossiping as groups of women will do. The industry of the women is beyond all praise; nor, indeed, do the men seem at all disposed to hinder its fullest and freest development; for, from hauling a harrow or digging the land, to the carrying of peats, we have seen them at all kinds of work, and at all hours, from "early morn" to "dewy eve." Not seldom in our rambles did the chivalrous feelings of southern lands dispose us to kick the men into a sounder state of feeling on the subject, for it is not pleasant to see women degraded into the condition of beasts of burden. They seem, at all events, pretty well used to it, and we suspect they would look upon any attempts at interference with the custom as an invasion of their vested rights, and of the dear delicious custom or fashion which binds all classes in all climes in its bonds.

On reaching the top of the hill round which the road gradually winds, and in traversing which a beautiful view of the bay and of the islands in the North Sea may be had, and ample time afforded too for the enjoyment of the prospect—for Shetland ponies in the early season are leisurely in their habits, and not without due consideration apt to be incited into even a gentle trot—we had the first opportunity presented us of seeing the characteristics of the country; and certainly the prospect was dull enough—bare hills and black and dark moss, with patches of coarse herbage scattered here and there; few and far between, oases in a desert of moss, round and upon which hovered living objects, of what kind—so odd and unusual did they appear—it was at first difficult to tell. The first sight of a Shetland sheep, at least such a one as greeted us as it sprang up on the moss before us, is a thing to be remembered. 'Tis difficult to describe; you may make it all that fancy paints it, if you make it "pretty fairly unlike" some of our best south-country breeds. To see them start up through the mist, they looked at times rather queer-looking spectres, and resembled diminutive dromedaries or camels, with long legs and scraggy necks, and wool hanging in festoons from their wretchedly thin bodies. The following is a description of the peculiarities of the breed of Shetland sheep:—"It is small; not often horned; ears pointed and erect; face, back, and tail short; fine boned; legs long; naturally wild; active and hardy, and little liable to disease; the colour generally white; sometimes ferruginous, grey, black, and piebald; the wool very soft and very fine. The more damp and mossy the pasture, the softer the wool; one of the causes of which probably is deficient strength and nourishment; another, the astringent nature of the food."

The mutton of the Shetland sheep is considered good, and, as far as our experience goes, resembles closely, both in high colour and flavour, that of the Welsh sheep. The wool, as above stated, is

exceedingly fine, and is highly prized by the natives, who work it into various articles for domestic use, and largely also into those soft shawls, veils, mits, &c., so favourably known, and so much esteemed, in the south. By knitting these articles for sale, the women of the Shetland families add materially to their income, and they lose no opportunity of waylaying strangers to induce them to make purchases. You cannot enter a Shetland house, or rather hut, or pass through a Shetland town, without being importuned to purchase; and truly beautiful some of the articles are with which they tempt you. The wool is so fine, that from one ounce three thousand yards are often spun—forming a thousand yards of threefold worsted. Stockings knit with this beautiful material are so fine as to be passed through a finger-ring, and have fetched often so high a price as two guineas the pair.

The sheep form a principal source of revenue to the Shetland proprietors; but a serious casualty, affecting their value, arises from the habit of the animals in seeking a precarious meal among the sweet herbage growing amongst the rocky precipices which skirt the sea, and into which they are often precipitated. In the small islands which abound in the group, the pasturage is luxuriant and rich, "consisting chiefly of *festucas, plantagos,* and *statice,* top-dressed by sea-spray and the exuviæ of sea-birds, and in these even the improved Leicester breed of sheep thrives as well as to be the most profitable of any."

The scantiness of the food, which keeps the poor sheep thin, keeps the cattle also. Nearly all we saw were in a state of attenuation pitiable to behold—frames of bone-work, with skins stretched tightly over them.

"The cow is small, the four quarters seldom weighing more than two cwt.; the quality of her milk is excellent, and its quantity, in relation to her size, abundant—sometimes reaching sixteen imperial quarts a-day. The ox is gentle and docile, and for draught is better suited to the present state of Shetland than the horse. Both ox and cow are often fourteen and sixteen years old before they are fattened for the knife; and yet the beef is observed to be tender, fine-grained, and highly flavoured. . . . Their food is natural pasture, containing many aromatic plants. The breed is a peculiar one; and the animal having arrived at adult age, the full flavour is attained—different in this from high-bred stall-fed cattle, which, though they have reached their full size, have not gained in all respects the maturity of their kind. . . . It is likely," continues the authority whom we quote, "that the cattle, horses, and sheep were derived from Norway; and it might not be fanciful to trace them even to the Caucasian range, the original seat of Odin and his people, whence they emigrated into Scandinavia [illegible] their families and flocks; at least there is a marked [illegible] these animals and other well-defined [illegible]

[illegible] the Shetland pony, so

well known for his diminutive size, his hardihood, strength, and spirit. Without this useful animal, for traversing the roadless interior, and the boats for skirting the coasts, the Shetlander would perforce be tied much to one locality. They are exceedingly hardy in their habits, being rarely stabled, and pick up on their own account a scanty livelihood on the moss or on the sea-beach, where they find ample supplies of drift sea-weed, of which, in common with the cow, they are remarkably fond. The usual height of a pony is from 38 to 44 inches, seldom exceeding the latter height. The usual colour is a dark mouse-grey; and the animal, till he is three or four years old, is covered with long shaggy and woolly hair, which imparts to him a peculiarly wild and weird aspect as he scampers past you on the moss. Although he is singularly free from vice, he is not so docile and gentle as horses of other breeds. The ponies traverse the hills in herds, almost entirely left to themselves—it being only in times of severe snow-storm that they receive a scanty feed from their owners. It is curious to note the instinct which prompts them to run to the homestead on the near approach of a storm.

Possessed of great strength in proportion to their size, they are now much in demand for labour in the coal-mines of the north of England, in the low galleries of which they are employed to draw the "corves" or waggons. This demand has greatly increased their price. Twenty years ago, a good pony could be had for thirty-five or forty shillings; they now bring as much as from £6 to £10. For a very beautiful animal we were asked so high as £15. They are sure-footed and sagacious; and should the traveller be overtaken with a thick mist, as we were once, he may trust to his pony to take him safely home.

"No breeds of these three species of animals," says the authority from whom we have already so often quoted, "can, as a general rule, be better adapted to the Shetland Islands than those that are native to them; and, as they are always in great demand, we should do well zealously to cultivate them. All that is necessary is such a sufficiency of food and care as will not encroach too much on their natural habits and hardihood, and a persevering selection of the best animals for breeding. Yet, if premiums had been held out for producing change and degeneracy, it is difficult to imagine a course of management better calculated to produce them than that which has mostly been pursued. A pernicious practice has too much prevailed of crossing with larger and incongruous breeds from Scotland; and the progeny, as might have been expected, displays all the bad points, with few of the good, of the parents. A natural but rough antidote to these evils is in some measure to be found in bad seasons, which fall with fatal severity on the degenerate. One very evident and easy mode of improvement would be for proprietors to keep males of a good race and mature age in different districts for general use, and insist on all inferior ones being removed; and it could be so easily arranged that no party could suffer loss. The tenants suppose that every one's business is no one's; and

it hence not unfrequently happens that calves and lambs especially are wanting, because a sufficient number of bulls and rams are not reared, or those that are reared are too young, or of a bad stock. The annual loss to the country from this source alone is far greater than many not attending to the subject could imagine."

Pigs are pretty generally reared; but, numerous as they are, their numbers might be greatly increased, and that at the expenditure of little labour. The breed is peculiar: "Small-boned, erect ears, woolly next the skin, active, hardy, and easily fed; and the pork is of very delicate flavour." The pigsty is generally at the end of the house; the animals are not always confined to its precincts, but are allowed to roam fancy free, not seldom warming themselves at the peat hearth of the cottage. Fowls are kept in considerable numbers, and flocks of geese are now and then met with. Both pigs and poultry might be rendered a still more lucrative portion of a Shetlander's farming than they are; but trouble seems to be grudged, and labour, when it is done by few, is not considered desirable to be increased.

In crossing from Lerwick to Scalloway, the traveller has to go over a ridge of considerable elevation; and, from the point where the road descends rapidly to the bay or voe, a capital view is obtained of the village, the bay and the sea stretching far away, studded with islands. The prospect was from this point, indeed, very fine; and the mist, which had been descending for some time, clearing up as we reached it, like the rising of a curtain, rendered it all the more delightful. The Castle of Scalloway, to the left of the village, a fine old ruin, adds to the interest of the scene. This castle was built by the infamous Patrick Stewart, better known as Earl Pate, to overawe the inhabitants of the district, and enable him the better to enforce his pitiless exactions. This individual, who was the scourge of the Orkneys and the Shetlands, was the son of Robert Stewart — natural son of James V.—who in 1581 was created Earl of Orkney. Patrick Stewart, who succeeded to the title, was a man of savage disposition, and perpetually engaged in acts of local oppression. Carrying out these by the aid of a hired band of desperadoes, he proceeded to such extremities of cruelty and exaction, that James VI. was at last forced to send a strong force to capture him. This was effected, and the earl was executed in Edinburgh, to the great joy of those whom he had so long and cruelly despoiled.

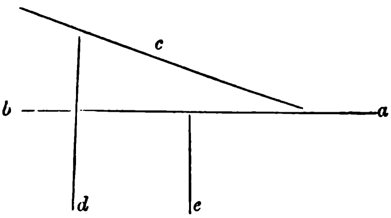
Descending the steep and, to any but a sure-footed pony, dangerous road leading to the village from the crest of the hill, we came upon a queer-looking building, which, being placed beside a little stream, was evidently a mill. We dismounted to examine, and had the pleasure of [illegible]ing in it an exemplification of the first stage of [illegible] the rudeness and roughness of primitive con[illegible] employed was of the horizontal class, so largely

used in the United States of America—this being the only form, we believe, adopted in the islands—about 3 feet in diameter, and with the boards or vanes placed obliquely to the shaft. The end of the shaft revolved in a rude "step," supported by as rude a lever, formed of a rough misshapen piece of timber, and the outer end of which was adjusted, to regulate the distance between the grinding stones, with a bar of wood, which passed upwards through an aperture in the floor of the building above the mill-race. To the upper end of the wheel-shaft, in the building above, the upper grinding-stone was fixed. In accordance with the primitive simplicity of the whole affair, the door was unencumbered with a lock, so we entered freely to examine the interior. The stones were unenclosed, and the meal or flour being projected at once on to the floor—which, if usually in the filthy condition we found it — would not be improved in quality. The adjustment of the distance between the stones was effected in a peculiarly primitive manner. To the end of the bar mentioned above, as being connected with the lever on which the step supporting the axle or shaft of the vertical wheel is carried, a cross-bar is provided, projecting on each side; the ends of this rest on two heaps of stone of equal height. As the distance between the grinding-stones is desired to be increased, the heap of stones is increased in height on each side of the cross-bar of the adjusting bar, raising it further from the ground, and, through its agency, the vertical shaft of the water-wheel, with the grinding-stone at its upper end. To decrease the distance between the stones, the converse operation is gone through. The insertion or taking out of a stone is thus made to do the work performed in other regions by the turn of a screw. Such a mill, rude as it is—wood being nearly exclusively used in its construction—can, with a good supply of water, grind some eight or nine sacks a-day.

As there was no inn at Scalloway, we had to "sorn" upon a private family for dinner, one of the leading dishes of which afforded an excellent exemplification of the truth of the adage that "evil communications corrupt good manners;" for the pig, which had provided it, had evidently been feeding on the refuse of a fishing-station, to such an extent that, with eyes closed, it was difficult to say, when eating his carcass, whether it was fish, flesh, or fowl: fish, after all, however, decidedly predominated. But if the ham was but "so-so," the *radishes* were superb—for the components of our meal were distinguished by a neat simplicity—and the whisky potent enough; ale or porter could not be had in all the village for love or money, and our inquiries after *Bass* were met with looks of mild astonishment. The radishes were evidently the pride of the landlord, such monsters having been rarely produced in such a climate. We hope that his stock was a large one, for having little else to stay our keen appetites upon, we made them disappear with a rapidity which would have astounded even a vegetarian. The concluding ceremony of

our visit was the bringing out of the usual stock of Shetland knitted-work, of which we were induced to purchase sundry specimens. Our ponies fared better in the matter of dinner than we, for we managed to get them a good feed of corn ; a rarity which probably they never enjoyed before, or will again, and the good effects of which were pleasantly displayed in the trots, canters, and gallops we managed to wheedle out of them in returning to Lerwick. The contrast between our progress going and returning reminded us of the delineations of Thorley's—of cattle-food fame—graphic genius—"Before" and "after" the "feed."

In returning, we contrived to hunt up a specimen of the old Shetland plough, which we should liked to have purchased for presentation to Professor Wilson's Industrial Museum. The Shetland plough, little used nowadays, is constructed entirely of wood, with the exception of the coulter, which in outline resembles those ordinarily in use in the south. The following diagram will explain sufficiently well the arrangement of the parts of the old Shetland plough. *a b* is a horizontal bar, to the end, *a*, of which, the draught-chain or rope is attached. This is strengthened by the diagonal *c*, mortised into the upright *d*; *e* shows the position of coulter. The mould-board is placed at *d*, and is simply a flat board placed at an angle to the upright. The whole is of light and rickety construction, and is capable of working only in loose soil : at best it can but scratch the surface.



The land is generally cultivated by means of the spade, which is as unique in character as the plough, to which it is preferred. The blade is very narrow and short, about 5 inches each way, and tapers considerably to the edge ; the shaft is long and tapering, about 4 feet in length, and is unprovided with a handle or cross. So narrow is the blade that no room is afforded on either side of the handle to put the foot on for leverage as in our spade ; to obviate this, a little above the blade a mortise is made in the shaft, into which a piece of wood is inserted, this projecting on the right side only. The method of using this primitive implement is peculiar, and with [illegible] land is rarely cultivated by one individual ; generally three workers stand in a row. Pressing the blades into the soil, with their right feet on the projecting pieces, they simultaneously lift the loosened part, turn it over, and break it up with a few blows on its surface ; they then move to the right and perform the same operation, and proceed till the whole breadth is broken up. In lifting the soil, the two outside workers make their spades tend with a peculiar movement of the body towards the centre worker. The ground thus worked up is harrowed [illegible] light harrow which we more fre-

quently witnessed dragged by a poor woman than by her lord. The ponies, we believe, are so weak at the season when harrowing is required, through the miserable privations which they have had to endure through the winter, that they are incapable of doing field-work of any importance.

We returned to Lerwick by the old road, and had an opportunity of seeing the remains of one of those curious structures called *Pictish* Burghs. They are, however, considered by authorities to be of Scandinavian origin, having probably been built by the rovers of the north as watch-towers or strongholds. The most perfect remains of these interesting structures are to be met with in the island of Moossa, not far from Lerwick. They are circular in form, without door or windows, and have passages built in the thickness of the walls.

Scalloway is in the parish of Lingwall, the agriculture of which is, on the whole, in an improved and improving condition. The soil is generally of a light brown, black loam or moorish, with a subsoil in peaty ground of ferruginous substance. In course of time this subsoil yields to the plough, and, on being mixed with the moss, is said greatly to improve the soil. The subsoil in meadow land is blue till, mixed with small stones. In cropping, an improved rotation has been introduced: 1st year, Turnips and potatoes; 2d, Bigg barley with grass seeds; 3d, Hay; 4th, Pasture; 5th, Oats. A fatal scourge to which the crops are subjected must be noticed here. This is the "ground fog." This mildew arises from wet ground in slight frosts—especially during a north wind in summer or autumn—like the smoke of numerous fires; and wherever it spreads, there vegetation is blighted. Its influence on the potatoes is remarkable, not only blighting the stems, but rendering the roots peculiarly unpalatable. The influence of this fog is, however, often partial; one part of a field being destroyed by it, the other part remaining untouched.

Opposite Lerwick is the island of Bressa or Bressay, the space between the two islands is called the Sound of Bressa, and forms the safe and capacious harbour or roadstead of Lerwick. Looking from the town of Lerwick, the most prominent object on the island is the Ward or Beacon Hill, near the south extremity. This, rising 700 feet above the sea-level, of a conical form, and clad with a sombre covering of moss, "brown and dark as is the ribbed sea sand," presents a gloomy appearance, but which at times, in strong sunlight and under passing clouds, is relieved by the variety of colour, and the light and shade playing on its sides. The southern side of Bressa abounds in cliff and rocky scenery of the wildest and most magnificent description. We took boat one day to explore it, and, being favoured with a day more than usually adapted for the excursion, we coasted along the base of its sullen and frowning ramparts, and drank in, to our heart's content, the spirit of Shetland sea-scenery. On the south-west point is a towering headland, some 400 or 500 feet

high, the name of which is the Bard of Bressay. Viewed from the sea, it is grand and imposing, the face of the hoary cliff being broken up into towering peak and shattered crag and crevice, trodden only by the foot of seafowl, or flapped by the eagle's wing. The interest of the point is wonderfully enhanced by two magnificent arches, perfectly Gothic in outline. These are formed by two projecting pillars, or rather buttresses, which, by some strong convulsion of nature, have been rent from the main mass, and project into the sea so much as to form arches of magnificent width and height, through which the giants of old might have wended without bending their waving plumes. The two pillars resemble, with wonderful accuracy, the flying buttresses of a Gothic cathedral, but mightier far than the hand of man ever fashioned, or mind conceived. In fit keeping with the gloomy grandeur of this scene, we saw—perched on a rock which showed but a point above the swelling waters—a solitary cormorant, which, as we approached, gave out its ominous croak, and, expanding its black wings, floated away slowly and sullenly over the waters. It was a relief, and gave something of human interest to a scene otherwise almost too oppressive in its silent solitariness, soon after to trace a single sheep, with its tiny lamb, picking precariously a path in the face of the cliff, hundreds of feet above us—a false step between them and death. Not far from this point is the entrance to a cave, only accessible, however, in the finest of weather. The fates, however, being propitious to us, we were enabled to enter it at comparatively little risk. The passage to it is obstructed by a rock right in the centre of the entrance; and as even in the calmest weather a ground-swell heaves the waters, it took some little dexterity on our part to steer the boat safely in. The entrance is formed by a magnificent arch high overhead, and the sides of which are beautiful with the gorgeous and varied colouring of the rocks. The interior of the cavern is tortuous and narrow, and can only be seen to advantage by the light of torches. Then the glistening stalactites greet the eye, and gigantic figures and unearthly shapes start from the rocky walls, carved by nature's hands, and chiselled into curious shapes and fantastic contortions in ages long gone by. We steered the boat far up into its dark recesses; the gloominess of the place, and the boom of old Ocean, as his waves dashed up the entrance, and sounded in thundrous tones from its sides, deeply impressing us. We left the cave with black visions of its horrors in times of storm.

Leaving the Bard of Bressay, we struck across the entrance of a deeply-indented bay, and rowed slowly (for little wind bent our sails) some four or five miles, till we reached the Holm of Noss. Noss is a small island, separated from Bressay by a narrow sound; it forms a fertile pasture-farm, and its principal feature is a headland 700 feet in height. The "Holm" is a detached rock, the top of which—level, or nearly so, with the adjoining cliff, from which, in some

great convulsion of nature, it has probably been rent—is covered with a patch of nutritious pasture. This being too valuable to be kept unused, an adventurous cragsman climbed up the almost perpendicular sides, and fixed strong stakes in the ground at the edge nearest the main cliff; a strong cable was fixed to this, and thrown over the void, while its other termination was fixed on stakes in the soil of the mainland; a cradle or box was swung on this rope, and, being pulled across by ropes and pulleys by the person adventuring in it, provided a means of transit for sheep to eat the pasture of the Holm. We sailed round the Holm, and, passing between it and the mainland, we looked up, and could form some notion of the strong head and steady eye required by him who ventured on the tremulous rope stretched above. When we visited the Holm, the rope of communication had been taken down, as its presence, we believe, only acted as a temptation for parties to venture across, the danger of which was not repaid by any advantages obtained. We rowed along the coast a short distance farther, till we came to a bay or cove enclosed by black cliffs: these started sheer out of the water to a height of, it is said, 700 or 800 feet, or twice the height of St Paul's. The face of this horridly-frowning sea-wall was honeycombed by the action of the weather into thousands of tiny nooks and crevices, which afforded shelter for myriads of seafowl. As the report of our fowling-piece was echoed from the cliff, they rose in such numbers as fairly to obscure the light, forming a living curtain overhead, and filling the air with alarmed and discordant screechings. It was curious—at the foot of these beetling cliffs, which afforded no spot on which a sea-leaguered wretch could plant a foot to climb to safety—to find, as we turned into the cove, two or three tiny boats, with some men patiently fishing with line and rod. Oppressed with the gloominess of the place, we gladly turned from it, and not less gladly hailed the rising of a fresh and favourable breeze, which, in much shorter time than we had taken, with the men's painful rowing, to go, soon landed us at the old quay in Lerwick.

Bressay affords perhaps the only—at all events the best—example of good south-country farming, as applied to Shetland soil, and carried out under a Shetland climate. This is the farm of Kildibister, occupied by Mr John Penney, to whom we were indebted for much information on various points of Shetland agriculture. Mr Penney belonged originally to Aberdeenshire, and was brought by the proprietor of Bressa many years ago to act as his steward, and to introduce improved methods of farming. He ultimately took the farm on his own responsibility, and has been successful in showing to his less fortunate neighbours what can be done even in such an unpropitious climate. Mr Penney has drained a large portion of his farm, with drains from 20 to 40 feet apart, at a depth of from 3½ to 4 feet; the results have been very promising. We went over the

farm, and were much pleased with the evidences of careful and thoughtful culture presented to us. One field of rye-grass we noticed might have honoured any farm. Top-dressing was carried out on this field by Mr Penney to a very full extent, he giving as much as 560 loads to the 10 acres, each load being equal to about half a ton. Most of the manure was made at home, sea-weed forming an essential feature in its composition, but a considerable proportion was brought from Lerwick. Mr Penney keeps about forty head of cattle, for which he has an excellently arranged shelter-shed on his farm for winter and stormy weather. Of this stock, 16 are milking-cows and in calf. We were taken over a 7-acre field of turnips which had been recently drilled, and finished in a manner which presented a striking contrast to many fields we elsewhere saw. There is a somewhat curious history connected with the turnip-drill which was used on this field. It had originally been brought to Lerwick by an enterprising proprietor, who had contemplated, but had not carried out, its use. At his death, a sale took place of his effects—and this strange-looking apparatus being amongst them, attracted no little attention, and gave rise to no few surmises as to what could be its use. The auctioneer having a faint glimmering of a notion that it might be connected with farming, sent a message to Mr Penney, who attended the sale, saw at once what it was, and there being no bidders, had it knocked down to him for as few shillings almost as it had cost originally pounds. It has turned out a rare investment. Mr Penney cultivates his land with the swing-plough, and uses in other departments the implements and machines ordinarily met with among south-country farmers. The extent of his farm he reckons to be about 100 acres, of which half is in pasture, and half under crops. Measurement by acres is not known, the "mark" being used.

The general husbandry of the district is marked with much of the carelessness observable elsewhere. The old and favourite mode of cropping was raising oats and bear alternately, with potatoes every four or five years. The average yield of oats may be set down at 5 or 6 bolls to the acre; of bear, 8. Potatoes under good cultivation yield some 30 bolls to the acre. Turnips are a good crop, the soil and climate suiting them admirably. They are rarely visited by the fly; but a scourge is met with in the depredations of the mountain linnet, which crop the cotyledonous leaves which first appear. Cabbages are widely cultivated; the seed is sown in June, within small circular enclosures of stone—like the stells of pastoral districts in the south. Poor ground is chosen, and peat-ashes alone used as a manure, in order to check luxuriant growth. In the spring, the plants are set out within enclosures in richer soil.

Considering the high and sudden winds which sweep the lands, it is to be regretted that the habit prevails of allowing the corn to stand till it is dead ripe. This is a fruitful source of heavy losses

each season; top-dressing is used in corn as well as in grassland, the manure being spread above, after the seed is in.

Much might be done to improve the quality and quantity of the produce by eradicating the weeds which are everywhere abundant, and by draining and opening up the subsoil.

The hay crop is by no means well attended to, malting being too often the result of a careless mode of operation. A coarse kind of hay, composed of rushes and heaths, chiefly from the moors, is used as litter for cattle, and forms an important ingredient in the top-dressing for bear. If the example of Mr Penney could be more generally followed, the production of artificial grasses would open another source of gain to the Shetland farmer.

Narrowing space warns us to draw these desultory remarks to a conclusion, and affords us room only to say a few words as to the "home" condition of the general population in the outlying districts. Judged by even a low standard, the huts or hovels appear wretchedly built, and slovenly in the extreme; the woe-begone appearance of the exterior not being belied by what to us appeared the want of cleanliness and comfort of the interior. The cottages are generally built of stone and clay, not in all cases weather-proof; the roof of turf, with a scanty covering of thatch, kept from being blown off by the terrible winds that sweep the islands, by straw-ropes, stretched from side to side, anchored by large stones tied to their extremities, and which, dangling there, look odd enough. The roofs are not all pointed, but in many cases semicirçular, or waggon-shaped. The cottage generally is divided into two portions—one of which is the general living-room. There is no fireplace, but the peat is burned on the flat hearth, the smoke finding its way through a hole in the roof, and in no few instances filling the interior with pungent smoke, distressing even to the most ardent admirer of "peat-reek." The beds, shipboard fashion, are placed one over the other at one end of the room, and afford a sort of partition between the one room and the other. The lower animals are not grudged space in the huts, for we have seen "piggie" taking a comfortable snooze by the hearth, the "old woman" sitting at one side knitting the everlasting stocking, and flanked with the ever-appearing black teapot; for the consumption of tea is as much a passion with the Shetland women, as gin, beer, or whisky is with others farther south. It is dangerous to judge always by appearances; and the state of matters which one witnesses in the hut of the Shetlander, is not, as he may suppose, the result of squalid misery and hopeless poverty; on the contrary, the general condition of the Shetland peasant contrasts favourably with that of many of their south-country brethren in Scotland, England, and Ireland. Fish and oil from the sea—rolling always at, or near his door—fuel from the moss, he has always at command; and his small holding, with but little care, yields him store of potatoes and meal; while milk, bacon,

and poultry are often on his table. While seeing much to regret and pity, we saw more to be glad at, in the lot of the Shetlander. Providence is ever kind in its beneficence, nature ever compensatory in its arrangements: if we are deprived of one thing, we are lavishly furnished with something that well supplies its place. The Greenlander has his long night of many months, but his sky flashes with a light as cheerful as it is beautiful. So with the Shetlander in his mist-enshrouded, spray-dashed islands; he lacks many things that, judged by other standards, appear sad deprivations, but they are bountifully supplied with much that we could wish to be provided to the homes of peasants under sunnier skies and more propitious climates. So much impressed, indeed, were we with what we saw, and with the importance of new points of view opened up to our consideration of things of vital and social moment, that if the fates be propitious we may again wend our way northwards, and, with wider opportunities and ampler time, resume inquiries and renew pursuits, which were begun with pleasure, and attended, so far as we could carry them out, with no small profit. Should we do so, we may again trouble our readers with a few remarks, which we trust will be more interesting and practically valuable than those which we have now the privilege to lay before them.

ROBERT SCOTT BURN.

THE FARMERS' NOTE-BOOK.—NO. LXI.

*Evil Results of Over-feeding Cattle.**—The title to which this treatise lays claim, of being a new inquiry, may, as far as we know, be fully allowed; for we do not remember of the pathology of animals being formally treated of precisely in the same point of view. The subject is doubtless an important one, and the author deserves credit for having taken it up, and so far pursued the investigation. This he has done with much care, and some of the results to which he has arrived are curious and interesting, although, upon the whole, it will probably be thought that they are not sufficiently important to influence materially the practice, either of those that feed cattle, or of those that feed upon them.

In order to show the effects of over-feeding, the author first examines the appearance and structure of healthy muscle, and then compares that with the muscles of high-fed animals. This portion of the work gives a very distinct view of muscular structure, and

* *A New Inquiry.* Fully illustrated by coloured engravings of the hearts, lungs, &c., of the diseased prize cattle lately exhibited by the Smithfield Cattle Club, 1857. By Frederick James Grant, M.R.C.S. London, 1858.

will be interesting to those to whom the subject is comparatively new. The muscular portions of an animal are readily recognised after death by their characteristic red colour and firm crisp consistence. After a while, however, the muscles become relaxed and softened, and the colour assumes a deeper tint on exposure to the air. What we call the lean of animal flesh is muscle, and on examination it is found to consist of a series of bundles or fascicles of fibres, held together by a loose thread-like portion of cellular tissue. When the flesh is boiled—take, for example, the heart of an ox—the bundles of fibres may be easily peeled off in layers. When these bundles are moistened with water, and frayed out with the point of a needle, the fibres themselves are distinctly seen by a small magnifying power, and appear beautifully marked with fine cross lines disposed at regular intervals. Each fibre is enclosed in a thin membranous sheath or tube; so that each muscular fibre consists of an external envelope, and a number of very fine filaments; and the fibres themselves are collected into bundles, which are held together by cellular tissue enclosing fat.

"I have purposely excluded from the brief description of muscle," says the author, "all notice of its nerves and blood-vessels. These ramify as a fine net-work amid the cellular tissue and fat *between* the fibres, but do not penetrate their sheaths. *Nor is fat found within the fibres among the fibrillæ.* The fibrillæ themselves are the *essential* structural elements of muscle, and in these filaments reside both its contractile power and nutritive quality as *human food.* But the fibrillæ present a variable appearance and arrangement. The characters of the fibrillæ, as a test of the nutritive quality of meat, should therefore be carefully studied. A single fibril viewed by itself appears to consist of a linear series of dark spots with light intervals; an arrangement best seen when the fibrils occasionally split up longitudinally. The lateral apposition of these dark spots in adjacent fibrils produces the appearance of transverse lines already mentioned. More frequently, however, after death, the fibrils break up laterally, and a number of little bright vesicles are seen, each with a dark centre. The disintegration of the fibrillæ may be seen in meat which has been kept for some time after death, and no doubt implies the total destruction of the muscular contractile power, but not necessarily the deterioration of such meat for food. The nutritious elements are still within the fibres, although broken up and disarranged; but they have not been removed and substituted by fat. The substitution of this less nutritive material may ensue; and this change, no less than the accompanying alterations of colour and consistence which the muscular texture then presents, contrasts remarkably with its appearance and structure in health."—P. 17. These remarks are necessary to render Dr Grant's description of the diseased structure arising from over-feeding more easily understood.

On examining the heart of a one-year-old Southdown wether, fattened up to the prize-competition pitch, its external surface was found to have become soft, greasy, and of a dirty yellow brownish-colour, here and there mottled with yellow spots of fat imbedded in the *substance* of the heart. On opening the two ventricular cavities, their internal surface and substance were equally soft, greasy, and yellow throughout, an appearance due to the infusion of fat between and *within* the muscular fibres, of which the heart should chiefly consist. The microscope showed that *this substitution of fat for muscle* had really ensued. The characteristic cross-markings were no longer visible; the fibrillæ within the fibres were entirely broken up and *replaced* by bright globules of *oily fat.* It thus appears that the healthy structure of the heart had thoroughly degenerated by the *substitution of fat* for muscle. Other instances are given in which similar effects from over-feeding were observable in sheep. In such cases, too, the liver was usually diseased; in one instance thickly studded with large dark spots beneath its peritoneal coat, which are produced by the extremities of the hepatic veins gorged with blood, this hepatic congestion being due to the feeble contraction of the diseased heart during life. The lungs also were found to be in an unhealthy state, mostly flabby, and not crepitating with air on being pressed between the fingers. Nodules were seen in some instances of the size and shape of kidney-beans, imbedded in the substance of the lungs, which contained numerous worms (*filaria*) in different stages of development.

In horned-cattle similar effects were observed, but in a still more aggravated form. In a four-year-old Devon heifer, exhibited by the Prince Consort, the substance of both ventricles of the heart had undergone complete degeneration into fat, in which state it forms a striking contrast to the healthy heart of a heifer, as represented in the very beautiful coloured plates by which Dr Grant's treatise is illustrated. The fat, under the microscope, consisted of bright shining globules within the muscular fibres, the fibrillæ of which had entirely disappeared. One of the papillary muscles had its fibres actually broken up, and yet it is on the muscles so named that an essential movement in the action of the heart depends, and the rupture of one such muscle must produce sudden death. In another instance the muscular fibres had given way near the apex of the ventricle, and a blunt probe could be readily introduced through the substance of the ventricle, almost into its cavity. The thin lining membrane (*endocardium*) had, fortunately, not been ruptured, otherwise instant death would have ensued; but this would [illegible] happened at any moment on the slightest exertion. The animal in which this appearance was observed, although under three years of age, weighed upwards of 200 stone, and was eating 21 [illegible] oil-cake a-day, besides other food.

[illegible] briefly nar[illegible] the most important results of Dr

Grant's investigation, limited as they necessarily were to certain parts of structure, but these parts the most essentially vital. It thence appears that, under the present system of rearing and feeding, one disease is of most frequent occurrence—namely, conversion of the heart into fat. "I need scarcely advocate," says the author, "the special importance of this result, for no one can dispute the fatal tendency of a disease by which the structure of an organ most essential to life has degenerated into fat. The stomach may, indeed, prepare food for the production of blood, and the lungs and kidneys may purify it of excrementitious matter, but these departments of the blood factory are only subsidiary to the heart, whose special duty it is to propel the vital fluid to the most distant recesses of the body, that every part may be nourished and renovated. Yet I found the great central organ more than any other damaged. In the sheep, particularly, the heart had lost its contractile and propelling power, and was converted into a flabby, inert lump of fat. This change had, moreover, ensued not through the mere accumulation of fat around the heart, whereby its contractile movements would be mechanically impeded. Such an accumulation had, indeed, taken place in the bullocks and in the Devon heifer of the Prince Consort's more especially. Nor did the change in question imply the mere interstitial deposition of fat between the muscular fibres, of which the heart *should* chiefly consist, but the actual *substitution* of fat for fibrillæ *within* the fibres."—P. 32.

And now comes the question in which the public are most concerned—namely, Whether the flesh of animals fattened in such a way as to impair their health and induce a state of disease, is thereby rendered unwholesome as human food? The author of this treatise thinks that it is. Such meat no longer retains its healthy structure and nutritive quality, although, when degenerated into fat, it may still preserve the appearance of ordinary muscle, and thereby deceive both buyer and seller. We should, therefore, in his opinion, expect in vain to replenish our own muscles by the use of such food. The flesh of animals which has been produced by organs themselves diseased, is itself also necessarily deteriorated, and ought not to be regarded as prime samples of human food. These conclusions ought certainly to have some weight with the public, and make them at least hesitate before paying extra price for the flesh of a prize ox or sheep. A considerable degree of fatness is desirable to bring the flesh to its greatest perfection, both in regard to consistency and flavour, but no encouragement should be given to produce animals of such monstrous dimensions as we witness at cattle-shows, if they are intended for the shambles. It is necessary, indeed, to feed animals occasionally to excess as a test of the feeding qualities of a breed, or to try their capacity for taking on fat; the facilities with which some kinds fatten is very great as compared

with others, and this can only be ascertained by experiment. But this has reference to the breeder and feeder only; and when once the feeding qualities have been ascertained, it is unnecessary that fattening should be carried to extremes in animals intended solely for the butcher. Humanity to the animals themselves would dictate moderation in this respect, for the state to which they are frequently reduced must render existence a burden to them. "A pen of three pigs," says the author, "belonging to his Royal Highness the Prince Consort, happened to be placed in a favourable light for observation, and I particularly noticed their condition. They lay helplessly on their sides with their noses propped up against each other's backs, as if endeavouring to breathe more easily, but their respiration was loud, suffocating, and at long intervals. Then you heard a short catching snore which shook the whole body of the animal, and passed with the motion of a wave over its fat surface, which, moreover, felt cold. I thought how much the heart, under such circumstances, must be labouring to propel the blood through the lungs and throughout the body. The gold-medal pigs of Mr Morland" (he speaks in reference to the show of the Smithfield Cattle Club in 1857) "were in a similar condition—if anything, worse, for they snored and *gasped* for breath, their mouths being opened as well as their nostrils dilated at each inspiration; yet these animals, only twelve months and ten days old, were marked '*improved* Chilton breed.' They, with their fellows just mentioned, of eleven months and twenty-three days, had early come to grief. Three pigs of the black breed were in a similar state at seven months three weeks and five days; yet such animals 'the judges highly commended.' . . . . Instead, therefore, of pursuing the present system of rearing cattle, much as it may test the qualities of food, and other matters of minor importance, let breeders, feeders, exhibitors, and prize-judges, alike visit the slaughter-houses; let them do this with a due knowledge of diseased appearances, and let them thus discover that system of rearing which is most compatible with the health of cattle, and which produces the largest amount of the most nutritious food for man. Under the present system, the public have no guarantee, and are not insured the best, if indeed the cheapest food. The bulky withers of a fat bullock are no criterion of health, and its flat, tabular back may conceal the revolting ravages of disease."—Pp. 12, 38.

The Manure Pit (*La Fosse à Fumier*).—Such is the title of a brochure lately issued by M. Boussingault. Having for a considerable period devoted his powerful intellect to the investigation, scientifically and practically, of the subject of farmyard manure, and being impressed with the importance of paying due attention to its production and preservation, he has more than once laid his views before the public, in his usual clear style. In his *Economie*

Rurale, published in 1851, he says that "one can at first sight judge of the industry and degree of intelligence of a farmer, by the care which he bestows on his manure-heap. It is deplorable to see with what negligence the manure is allowed to waste in a great part of France. We come on villages (and they are too numerous) where the manure is placed exactly in such a position as to receive all the rain which falls from the roofs of the houses, as if it was an advantage to have it washed by the rain-water." These remarks may be considered as applicable to Scotland as to France; for we have often been surprised at the carelessness which many farmers, most intelligent in other things, manifest in the preservation of their manure. How often do we find, at the steading of a farm otherwise well managed, the liquid not merely trickling, but flowing from the dung-heap! "To preserve," says Boussingault, "is to produce. Is it not evident that if, by proper care, we can prevent from waste the half or the fourth of the fertilising agents taken from the byres and stables, by the same proportion we would increase the number of animals on the farm, in a manurial point of view? In other terms, we would obtain more manure from the same quantity of forage. In France, and I may say throughout the whole of Europe, the negligence observed in the preservation of manure occasions greater loss than most people suspect."

He then proceeds to describe the position of the dung-pit, and the conditions necessary for its construction. It should be placed in proximity to the stables and the byres; and the following conditions should be attended to: 1. It should be so placed and constructed that the water shall not escape from it; 2. That this water should be allowed rather to flow into a tank, from which it could be pumped up on the manure in dry weather; 3. That no water from without, excepting the rain which falls on the surface, shall be admitted into the depot; 4. That the pit may be of sufficient extent that the manure may not be accumulated to too great a height; 5. That the interior of the depot shall be accessible to carriages. He recommends, besides, that the depot should be somewhat concave, and that the tank should be placed in the lowest part, towards which the declivity shall be sufficiently great to allow of all the urine from the stables, and byres, and wash-house flowing easily into the tank. The litter should not be thrown at random on the top of the heap, but spread equally on the surface, as any inequality occasions an empty space, the consequence of which is mould, or, as it is called in Scotland, *fire-fang*, in the dung in that part. To prevent this evil to the manure, it should be watered frequently in hot weather, or the heap should be compressed by some means; as, for instance, at Bechelbronn, where a loaded waggon drawn by four horses is made to pass over the surface. The thickness of the heap is also a matter of importance; for if too thick, there might be too great an elevation of temperature, and consequently a very great loss from the

decomposition of the manure. Experience has proved that the best thickness varies from 5 feet to 6½ feet. If the soil is of a porous nature, so as to allow of the water from the pit percolating through it, the bottom and sides of the pit should be made water-tight; or, as is done in Alsace, the manure should be placed upon a layer of earth, turf, marl, or any dry and porous substance capable of absorbing the liquid.

Though these remarks were made by a French scientific agriculturist, and, as we may suppose, intended to be applicable to the agriculture of his own country, they will be generally approved of by the farmers of this country. It is interesting to know the opinion of Boussingault regarding the depositing of manure under cover. "This practice possesses undoubted advantages," he says, "but it is rarely that it can be carried out on large establishments, where the collection of a mass of substances in a state of putrefaction in the neighbourhood of the animals, and other buildings, must be very inconvenient, and even insalubrious." In the department of the Nord, the manure-heap is placed in the middle of a plantation of elms, so as to shelter it from the sun. This he considers preferable to a roof over the heap, which protects the manure both from the sun and the rain, the latter of which is not very inconvenient if care be taken to keep off any water but what falls on the surface of the heap. Besides, roofs are too expensive to be seriously thought of for an establishment, and the timber of them would soon decay from the humid exhalations which take place from such a large fermenting mass. And a last, but not unimportant objection to roofs is, that they would very much interrupt the carriages in removing the manure at particular seasons when all activity is required. Such are Boussingault's views on the covering of manure-pits or heaps.

Great diversity of opinion still prevails regarding the advantage of adopting generally the practice of covering the dung-heaps. We agree with Boussingault that more is to be dreaded from the sun than from the rain, if due precautions are taken against allowing more water than the rain which falls on the surface from entering the depot, and against allowing any liquid whatever from escaping from the heap. Many circumstances must be taken into account before arriving at a definite conclusion about the benefits to be derived from covering a dung-pit—such as the locality in which a farm is situated—the climate—the rotation—the general system of management—and the kind of stock kept, whether cattle or sheep, or both. We may lay it down as a general rule, that, if the straw is scarce and the climate wet, it will be found an advantage to cover [illegible] But on farms where the four, five, or six rotation is followed, [illegible] there is an abundance of straw, and where one-half of the green [illegible] is consumed by sheep, and the other by cattle which [illegible] courts, or partly in each, it will

not be any advantage to cover the pit during the winter months, when the greater part of the threshing is performed. If house-feeding is practised in summer, the heap should be either frequently watered in dry weather, or it should be covered to protect it from the sun's rays. As a very great number of the arable farms in Scotland may be said to be included in this latter classification, or managed according to the system sketched above, we may conclude that it will not be found generally advantageous to cover the dung-heaps, which, however, should be properly constructed otherwise. We have known many instances in which the greatest difficulty has been experienced in dry winters to get the straw converted into manure, even though all the cattle were fed in courts, when, of course, most straw is required to keep them comfortable. But it will be said that an additional number of cattle should be kept, and the straw cut and mixed with grain or some other food, and given to them. Now, admitting that there is sufficient accommodation for more cattle, the question resolves itself into the most profitable way of disposing of the straw, whether by converting it at once into manure, as done in the best-farmed districts in Scotland, or by consuming it with cattle, during which process its manurial value is much deteriorated. Will the improvement in the cattle, arising from the consumption of the straw and the grain, or other purchased food, and the manurial value of that food, compensate for the loss of manurial value in the straw? The answer to this question will depend very much upon the state of the cattle market, by which the value of the improvement in the cattle could be determined. We think, however, that most of our practical readers will agree with us that, generally speaking, the profits derived from feeding with purchased food are not so great as to warrant those who convert their straw directly into manure, substituting for that practice the other method of disposing of it. If the manure made in byres is accumulated under cover, it should be mixed with alternate layers of earth, or other absorbent, to prevent waste; or, if it is not convenient to mix with such bulky material as earth, some fixer of ammonia, such as gypsum, M'Dougal's disinfecting powder, &c., should be added to the heap. This will prevent one of the evils complained of by Boussingault, viz. that arising from the proximity to the buildings of such a mass of putrefaction.

Our Farm-Labourers and their Dwellings.—Little more than four years have passed since the "Association for promoting Improvement in the Dwellings and Domestic Condition of Agricultural Labourers in Scotland" sprung into existence. The earnestly written "Plea" of the Rev. Harry Stuart, Oathlaw, in behalf of the agricultural labourers, may be said to have given birth to it. Though it was inaugurated under favourable circumstances from the support which it received at its first meeting from the influence

of rank, still the great majority of proprietors and tenants kept aloof from it, and regarded its proceedings with something more than a cold indifference. Its objects were misunderstood, the intention of its promoters were misrepresented. Some proprietors admitted the necessity of improvement in the cottages, but stated that they had not the means of making these improvements, while others fancied (for it was mere imagination) that the object of the Association was to raise subscriptions to aid needy proprietors in effecting what the state of their finances would not allow them to do. Many tenants took a practical view of the question. They said truly, that larger houses required more funds to furnish them, and higher wages to keep them up; and as they had shortly before had sad experience of the great disparity between wages and the low prices obtained for their produce, they naturally enough thought that, as it was impossible for them to raise the wages and find a living for themselves, they must look for a reduction of rent as the easiest way of settling the question. Proprietors, on the other hand, maintained that, in increasing the accommodation for farm labourers, they gave the tenants the cheapest means of supplying themselves with labourers.

It cannot be denied but that there were good grounds for some of the objections made to the establishment of the association. The Highland and Agricultural Society had, for some years previously, offered and awarded premiums for the best plan of new farm-cottages, for the most judicious improvements in the old ones, and for the best-kept houses by the servants themselves. Much good had resulted from the awarding of these premiums: there was a manifest improvement in the size and style of all new cottages built and old ones repaired, and in the manner in which they were kept; and a stimulus was given in the right direction, which it was thought would soon have accomplished all that the new association embraced in its objects. What use, then, said one class of objectors, was there for this association? Again, as often happens, people rush from one extreme into another; some proprietors, in repairing old houses or building new ones, had given more accommodation than the people required or wished for. The consequence was, that the spare rooms were unfurnished and unoccupied, and became a receptacle for lumber and filth; or, what was still worse, they were let out to wanderers, who worked when it suited their fancy, and often spent their evenings in poaching. And thus the very evils that the additional accommodation was intended to prevent, were aggravated, and both proprietors and tenants became less hearty in their philanthropic attempts to improve the condition of their servants by increased accommodation.

Notwithstanding these objections, the association has pursued its course steadily, and has increased in usefulness, in importance, and in the confidence of the public; and it must be highly satisfactory

to its supporters to know that their philanthropic labours have been crowned with such success, as evidenced from results patent to the observation of every one who takes an interest in the subject, and from the Fourth Annual Report of the directors now before us. In it we find a repetition of the rules of the association. Its objects are stated to be two:—1. "To excite attention, and to stimulate exertion, towards the required improvements;" and, 2. "To invite and receive communications from proprietors and others, in all parts of Scotland, in reference to the condition of labourers' dwellings, and especially to such improved dwellings for them as may have been erected; and to collect and disseminate, as far as possible, information derived from the experience of those who may have devoted attention to the subject." The success that has attended the exertions of the directors proves that these objects have been in a great measure accomplished. It must be admitted that the association was better calculated to carry out the first object than the Highland and Agricultural Society, with which it appeared to clash; for the directors of the latter regarded the attainments of this object as but one, and by no means the principal, of the numerous duties to which they were required to devote their attention; while the whole energies of the directors of the association were exerted towards its accomplishment.

The Report before us bears ample testimony to the manner in which the invitation of the directors has been responded to by proprietors and others, who have sent in descriptions and detailed statements of cottages erected on their estates and farms. Thus has the second object been fully accomplished. We are inclined to consider some of the cottages described as rather too large, but not too expensive, for the accommodation afforded; but it is better to err on the safe side; for, though they may be somewhat larger than the present generation cares about, there cannot be a doubt that the next will not consider them too large. "The directors most strongly urge the adoption of *three separate* sleeping or living apartments as the least accommodation that ought to be afforded for the proper division of the sexes in a labourer's family." They might have added also that three separate sleeping apartments are absolutely necessary where there is a family in cases of sickness.

We concur with the directors in their statement regarding the bothy system. They do not approve of it; but, as in many districts it is a necessary evil, they direct attention to the better arrangement and improvement of bothies where they exist. It would be most unreasonable and impolitic to insist upon the immediate substitution of cottages for bothies; for, besides the great expense that would attend the change, married men could not be found in the districts to occupy them. In a part of the county of Mid-Lothian, where the practice has hitherto been to board young men in the farmhouse, a good many cottages have lately been erected,

the effect of which has been to raise the wages of married ploughmen on account of the great demand for them. We cannot, however, too strongly urge on both proprietors and tenants the propriety of a gradual substitution of cottages for bothies, as the improvements which have lately taken place in agriculture demand an increased number of labourers, the supply of whom has been most deficient where these improvements have been extensively carried out.

There is one part of the report which gave us much pleasure. It is in the following words:—"Although the object of the association is primarily architectural, its title implies that, through the improvement of the dwellings of agricultural labourers, it distinctly aims at raising their moral and intellectual condition." External material objects have a great influence on our feelings and habits; they are intimately associated with one another; we are just as much creatures of associations as of circumstances. When we see a neat cottage embosomed in roses, honeysuckle, and other flowers neatly kept, it would be, if not unnatural, at least most contradictory to find anything but the strictest cleanness and order in its interior. We would observe also the same scrupulous tidiness carried out in the dress of the occupants, and the same habits of order and cleanness in everything they did; in short, there would be an absence of slovenliness about their persons and dwellings. Though possessed of like passions as other men, they would be kept more under restraint, and there would be none of that brutal indulgence too frequent, we regret to say, among the working classes. A higher tone of moral feeling would be engendered, and we would be sure to meet with a practical example of the saying, that "Cleanliness is next to godliness."

Numerous instances of the influence which the dwellings of the labouring classes have upon their habits and characters must be known to our readers; but there is one which was related to us, and which is so striking an example of it, that we cannot forbear from mentioning it here. It was the case of a servant girl, who possessed considerable personal attractions, and was so much respected by her employers from the faithfulness with which she discharged her duties, as to be considered one of the family. She was particularly distinguished for neatness in her person, and for her habits of cleanness and order. She had many suitors, but her choice fell on one who was calculated in every respect to make her happy. He was a journeyman tradesman in the receipt of good wages, leading a moral and religious life, respectable and respected. A house was taken suitable in point of accommodation for parties in their circumstances, on which the landlord promised to make considerable repairs, but which were never executed; and, being neatly furnished, it became the abode of the newly married couple. She carried to her own house the same habits of cleanness and order that she had cultivated in her master's; and much need she had

of them, for the greater part of her time was spent in keeping her rooms and furniture clean of the dust and soot which were deposited from the broken plaster and a badly venting chimney. In the course of time the cares and anxieties of a mother were added to those of a wife, and the hours spent formerly in keeping her house clean she was obliged to devote now to her children. The consequence was inevitable. The cause of the dirt being unremoved, it accumulated with rapidity and destroyed their furniture. In vain was the landlord appealed to to fulfil his engagement, but they were put off with fair promises; and such was the scarcity of houses for the labouring classes, they could not get a better. Worn out by her different household duties and her attempts to keep her house clean, and sickened by the dirt about her, so foreign to her nature and habits, she was unfortunately tempted to drown her cares by indulgence in ardent spirits. We will not attempt to describe the fall of this family from comfort and happiness to abject poverty and misery; suffice it to say, that the husband, finding his home uncomfortable, resorted to the public-house, and in a short time died the death of the drunkard, and received a pauper's burial. Nor shall we dwell upon the scene which presented itself to some benevolent individuals who visited the widow and her children shortly after the death of the husband. Want and desolation reigned in that dwelling; not a vestige of that furniture that adorned the rooms a few years ago, and in which she took such pride, was to be seen; it had all been pawned to gratify that insatiable craving for drink; four or five half-naked and starving children rolled on the floor crying for food, whose ruin was inevitable if not snatched away to some ragged or reformatory school; while in the corner, on a little straw, lay that woman, once pretty and attractive, but now a half-stupified and repulsive mass of humanity. And all this sad reverse had been brought about simply from an avaricious landlord neglecting to ratify an engagement with a labouring man.

It is somewhat remarkable how busy many people living in towns make themselves about providing suitable houses for our farm-labourers, when hundreds of cases such as that described above can be found at their very doors. The houses for our rural labourers, in Scotland generally, are far from being faultless; but we think that they can more than bear comparison with those provided for our urban workpeople. And it has lately been attempted to be shown, that immorality is very much on the increase among our farm labourers, and that the cause of this increase is the insufficiency of accommodation for them. Now, we admit at once, and we repeat the opinion stated above, that the tendency of insufficient accommodation in the houses of the working classes, both in towns and in the country, is to produce the evils complained of; but we have no grounds for believing that these evils are on the increase; indeed, it is unfortunate for the assertion made by these parties, that

this increase is said to have taken place after extensive improvements have been made in farm cottages, both in point of accommodation and general comfort, which has been the case for the last twenty years. We suspect that the reason why we never heard of the depravity of our labourers before from these gentlemen is, that they were ignorant of its existence; and their eyes being suddenly opened by the Registrar-General's reports and other means, they have mistaken an increase in their knowledge for an increase in the depravity itself. We repeat the opinion we stated in a former number of this Journal, that immorality and depravity do not prevail more among our rural than our urban labourers, and that there has not for some years been any increase in these evils. We admit, however, that there is a decided change in the character of our servants.

We stated before that the servants "do not appear to have their masters' interest so much at heart as of old. But masters themselves may be somewhat to blame for this, by widening the distance between them and their servants." To this we may add, that they are in general more careless of religious ordinances; and this indifference may be attributed in some degree to the spread of dissent; for we have known instances of parties who had been refused church ordinances till they had been subjected to the prescribed discipline, leaving the body with which they had been in connection, and attending on the ministrations of another clergyman for some time, till they could be admitted more easily to membership with his congregation. We have observed too, probably from the same cause, that, generally speaking, there is less pastoral superintendence than formerly, and the people do not look up with the same respectful affection to their minister as they used to do. The time was when the clergyman in Scotland was in reality the father of his flock, who, unasked, intrusted to him their joys and fears—when his influence with high and low was so great, that he became the cementing bond between them, and kept alive that kindly interest between master and servant which ought always to exist.

Cattle-Shows in France.—In making some remarks on this subject in No. 59 of the Journal, published last January, we adverted to the error committed by the French Government in offering premiums for the "best cattle imported from other countries," or for the "best animals bred from imported cattle," without any regard whatever to the breed; and we stated, at the same time, that "we are sure that the attention of the French Government requires only to be directed to the subject to introduce some improvements in its premium lists." We are glad to say that we have not been disappointed in our expectations on this point, as the following letter will testify. It will be gratifying to the breeders of Ayrshire stock to be made aware of the change in the premium list for local

shows of the French Government, alluded to in the letter, as it cannot fail to give a stimulus to the exportation from this country of that breed so valuable for its milking qualities.

GREENSIDE HOUSE, EDINBURGH, *June* 29, 1858.

TO THE EDITOR OF THE AGRICULTURAL JOURNAL, &c.

MR EDITOR,—It may perhaps be a matter of interest to some of your readers to know that the article on "*Cattle-Shows in France*," which appeared in your Journal of January last, may be presumed to have met with consideration, and its suggestions approved of by the French Government. In a report which was sent to me of a large district show which took place at St Brieuc, Côtes-du-Nord, in May last, and where prizes to the amount of £1600 were awarded, I observed that there were two classes of foreign cattle; "1. Pure Durham;" "2. Pure foreign breeds other than Durham."

I have received this morning a letter from my friend Mr Bonnemant, who thus writes me:—"I have to mention, that our Government has made a modification of its regulations for cattle-shows. At present, the Durham breed forms a class by itself, and other foreign breeds will no longer be put in competition with it. I know not whether or not it may be on account of my complaints that this alteration has been brought about. In any case, I am extremely well satisfied, since, henceforward, our Ayrshires will cease to be put into competition with the short-horns. You would do well to communicate this news to the Journal of Agriculture and Transactions of the Highland Society of Scotland, which was so obliging as to publish our letters complaining of the matter." I may mention that, through the kind influence of Mr Hall Maxwell, I got a translation of your article sent to the editor of a leading Agricultural Journal in France some months ago.

Mr Bonnemant, though an inhabitant of the *district* of the St Brieux cattle-show, did not exhibit cattle there. Being, I presume, unaware of the change in classification there and then adopted for the first time, he wisely declined to go and get beat. He, however, obtained first prizes for male and female English pigs (Middlesex).

I remain, Mr Editor, your obedient servant,

J. C. WHYTE DOUGLAS.

Reaping-Machines.—There is no better sign of the future permanent adoption of any new implement, than its steady and gradual introduction. Such has been the case with the reaping-machine. Few energetic and persevering farmers who supplied themselves with properly constructed machines, when public attention was first directed to them in 1851, have abandoned them; while many others, who were at first sceptical of their advantages, have now added them to the implements of the farm. It must be acknowledged that the impatience manifested by the first proprietors of machines was not to be wondered at, when we remember the annoyances to which they were subjected by breakages in the bad materials of which they were constructed. The more extensive use of them, however, within the last few years, has suggested many improvements in the mechanism, and has shown

the manufacturers the necessity of constructing the machines of good material, if they want them to be generally introduced among farmers. The harvest this year has, we have no doubt, given a further stimulus to their introduction, for seldom has the crop been in a better state for their working, and many who otherwise would have been put to great inconvenience from the scarcity of hands (the whole crop in the lower and middle districts having arrived at maturity at the same time), were enabled to cut down their crops in better state than could have been done either by the sickle or the scythe. In most cases the most slovenly and rough stubble is left by the sickle, the most untidy dishevelled sheaf and worst standing shock by the scythe; and when the crop is suitable, and the machine in good working order, the neatest harvest-field, upon the whole, will be found after the reaping-machine. It may be said by some, that as the grain is gathered up in the same manner after the scythe as after the machine, there can be little difference between the sheaves made of grain cut by each; but these people forget that the neatness of the sheaf depends as much on the manner in which the grain is laid down by the cutting-machine as on the gatherers; and there can be no comparison between the neat regular manner in which the grain is laid down by a good machine of Bell's, and the straggling way in which it is too often done by the scythe. In most instances the machine can work where the scythe can, though in many cases the latter is used where the sickle would have been more profitably employed. We by no means consider the machine perfect; but we think that it has now been brought to such a state in its construction, as that no farmer who has annually 50 or more acres of white crop to cut down should be without one. Cutting by the scythe should also be encouraged, there being great room for improvement here, as the grain is oftener hashed than cut by this implement, which could be of great service on every farm during harvest. We need not say that the scythe-hook, as used by most of the shearers, produces most indifferent work; and though it is generally calculated that one-half more work can be done by it than by the toothed sickle, it must be acknowledged that, unless expertly used, it leaves a very unequal and dirty stubble. When properly used, however, nothing can surpass the excellent finish of the work.

We have thought that it would not be uninteresting to present here the actual expense of reaping by machine, as detailed by different parties in different countries. Mr James Wilson, Wester Cowden, near Dalkeith, who was among the first of the farmers of Scotland to purchase a Bell's reaper, has now used it for several years, and has from time to time had the various improvements made on it suggested by Mr Bell and others. We have before us the details of four fields cut by his reaper last year. They are as follows:—

	£	s.	d.
One woman for 162½ hours, at 1s. 8d. per day of 10 hours, ...	£1	7	1
One boy for 80 hours, at 10d., raking and making bands, &c., ...	0	6	8
One boy for 27¼ hours, at 1s. 3d., do. do., .	0	3	5¼
One man for 117 hours, at 2s. 4d., binding, .	1	7	3½
One overseer for 17½ hours, at 2s. 6d., . .	0	4	4½
One man for 42 hours, at 2s. 8d., binding, . .	0	11	4
Two men with machine for 25 hours, at 12s. 4d., .	1	10	10
Expense of cutting 23 acres of oats—that is, at the rate of 4s. 9¾d. per imperial acre,	£5	11	0¼

SECOND FIELD OF WHEAT.

	£	s.	d.
Ten women lifting 1 day, at 1s. 8d., ...	£0	16	8
Two boys at 1 day 3¼ hours, at 1s. 3d., . .	0	3	5½
Three boys and girls at 10d. per day, making bands,	0	2	6
Three men for 1 day, at 2s. 4d., binding, . .	0	7	0
Two men for 1¾ day, at 2s. 8d., ditto., . .	0	9	4
One overseer for 1 day, ...	0	2	6
Two men and machine and horses for 12 hours, at 12s. 4d., ...	0	14	9½
Same people binding, &c. for 5 hours, . .	0	16	7
Cost of cutting 11 imperial acres of wheat, that is, at the rate of 6s. 7½d. per imperial acre,	£3	12	9½

Other 18¾ acres of wheat were cut at the rate of 5s. 6½d., the people being arranged as above.

If we add £2, 18s., the amount for tear and wear, and interest on the present cost of machine, to the gross sum for cutting these 52¾ acres, we will get an additional sum of 1s. 1d. per acre. When Mr Wilson lets his crop to be cut by the sickle, he pays generally from 11s. to 13s. per acre; and as the whole expense per acre of cutting both oats and wheat by machine in 1857 amounted only to 6s. 4d., there is a balance of about 5s. 8d. on an average per acre in favour of machine-cutting. Mr Wilson has had some improvements made on the machine this year by Mr Watson, Errol, at the suggestion, we believe, of Mr Bell himself. Since these improvements, it is much easier driven; and there is now no annoyance from stoppages formerly caused by the delivering-web, for which have been substituted five belts made of girthing, with fillets of wood riveted on them every 6 or 8 inches Owing to some delay in getting his machine from Errol, he has cut this harvest only 43½ acres of wheat and 13½ acres of oats—in all equal to 57 acres—at a cost of 7s. 7d. per imperial acre, including hire of horses, interest of money on machine, &c. Mr Wilson has now used the machine for five years, cutting on an average every year about 57 acres. During this period it has undergone many improvements, and has been used, as all newly-introduced machines generally are, under considerable disadvantages. Notwithstanding, he has effected such a saving in his harvest expenses by means of the machine these five years, as to be more than sufficient to pay all its first and subsequent cost, and the interest on

the capital laid out for it. It is to be observed that in the above calculations the expense of a man and pair of horses has always been counted at the full rate at which they could be hired, namely, 10s. per day.

Again, in the *Irish Farmer's Gazette*, Mr Hamilton writes that he cut down with the machine 31 Irish acres, or 51 imperial, of wheat, for L.10, 15s. 6d.; that is, at the rate of about 4s. 3d. per imperial acre, not including the expense of horses. As his people were quite unaccustomed to the machine, and the land was unsuitable for its working, he thinks that the reaping could be done for less, or about 3s. per acre, not including horses, under more favourable circumstances. In the same paper Mr Robertson states that he cut with the reaping-machine about 10 statute acres for L.2, 8s. 3d. that is, at the rate of nearly 5s. per acre—a crop the cutting of which with the sickle in his neighbourhood would have cost about 14s. per acre.

In the *Journal d'Agriculture Pratique*, M. Durand makes a comparison of the expense of cutting with M'Cormick's and Manny's machines. The former cut the crop at the rate of 3s. 11½d. per acre, including horses, while Manny's performed the same work for 3s. per acre; the reaping of the same crop with the scythe having cost at least 9s. 8½d. per acre.

There can be no doubt that, in point of economy, reaping by machine surpasses that by the scythe and sickle. But it possesses other advantages which should not be overlooked by the farmer. It gives him a command of his work at a season of the year when he is often quite powerless from the want of hands. How often has a great portion of the crop been standing quite ripe ready to be harvested, when in one night the loss has been as great from the shedding of the grain, as would have been sufficient to supply the country with seed for the next crop? A reaping-machine on each farm of sufficient size, by being kept constantly at work with a change of men and horses, would have prevented much of this loss. Reaping by machinery would also relieve the farmer of much of that annoyance to which he is at present subjected from the unruly bands of shearers whom he is obliged to employ and house about his premises; and it would enable him to make use of the services of many boys, girls, and others, who at present are useless from their inability to take part on the harvest-ridge.

AGRICULTURAL SUMMARY FOR THE QUARTER.

THE promise held out by the appearance and state of forwardness of the crops in the month of June have been amply fulfilled. The warm forcing weather we had in that month was succeeded in the beginning of July by cold and rain, which for a time threatened to check the growth of the turnips and other green crops. The latter part of the month and the beginning of August, however, were again distinguished for that warm sultry weather, accompanied by brilliant sunshine, which tend to hasten on the crops to maturity. In the last week of July, the greatest flood which has occurred in some districts since 1846, and in others since 1856, swelled the rivers to a height which caused many of them to overflow their banks. The waters rose with a rapidity that has seldom been witnessed in the history of floods in Scotland; in some instances they were suddenly converted from small clear summer-streams into roaring muddy floods. These rains were succeeded by very sultry weather, which made the crops rapidly ready for the sickle, the more so on account of the dashes of rain to which they had been subjected immediately before.

Harvest may be said to have been general throughout Scotland in the third week of August. In the earliest districts cutting commenced in the first week. In East Lothian and Roxburghshire the crop became unexpectedly ripe, and before the Irish reapers had come forward; so that great inconvenience was felt from a short supply of hands, and wages consequently ruled high. In the second week, though reapers poured in from all quarters, yet, from so much of the crop being ready to cut, and the determination of the workers to hold out for higher wages, there was no reduction in wages. Scythes and reaping-machines were much called into requisition. Many who were formerly opposed to the use of the scythe have this year employed them with great advantage, and we have no doubt that, if in another harvest the crop be as favourable for its use, it will very much take the place of the sickle.

Weather.—It is generally supposed that this has been one of the hottest years we have had for some time. The warm weather in April, so unusual at that season, and the extraordinary heat in June, may have given rise to the opinion. It may not be uninteresting, therefore, to compare the temperature of this with that of previous years. Last year the greatest heat experienced was in the month of July, when it was perfectly suffocating. The mean temperature of that month in 1857 was 2.27° higher than in 1858, while the mean temperature of June in 1857 was 2.43° lower than in 1858; thus corroborating the sensations of every one. The temperature of April 1857 was 1.59° lower than 1858. An interesting statement of the thermometrical and barometrical variations of the last thirty years, as compared with those of these years, occurs in

the *Gardeners' Chronicle*, to which we are indebted for some of the following facts. In the month of April of the previous thirty-two years, the mean temperature was 0.13° less than this year; and the average mean of the month of June during the same period was 4.27° less than this year; but in all the other months the mean temperature this year was actually less than the mean average of the thirty-two years. Again, the mean maximum of 1858 has been higher in every month, with the exception of February, than the average mean of the thirty-two years. In the month of June this year it was 10.15° higher, while the mean minimum was in every month lower this year than the average of the previous thirty-two; showing that the temperature during the nights this year has been unusually low. There is nothing in all that we have yet stated to account for the fine and early crop we have had this year. If, however, we examine the temperature of the soil, we will find some cause of the plentiful harvest. The mean temperature of the soil in 1858 has all along been considerably higher than the average mean of the previous thirty-two years. By the 16th of July the temperature of the soil, one foot below the surface, "rose as high as 68°; equal, in fact, to the heat of a moderate hotbed. Vegetation, then, has had plenty of bottom heat, and above ground an unusual amount of sunshine; a combination of circumstances which, with moisture, cannot fail to produce crops in great perfection." "The fall of rain has been less than usual, and the springs are at present lower than they have been for years. In consequence of excessive dryness at the roots, the leaves are dropping from some kinds of trees, as if after an autumnal frost." There has been 1.80 inch of rain less during the first seven months of this year than the average of the last thirty-two years, while the evaporation has been much greater.

Crops.—As might be expected from such a season, the crop is very fine in quality. In Scotland the wheat crop is above an average both in quality and yield; the barley a full average in yield, and superior in quality; the oats are of very fine quality, and expected to be of full average yield, contrary to expectations before harvest; they are, however, deficient in bulk. In England, the crop, though considered an average, is by no means equal to that of last year, the wheat in particular being far below it; but it [illegible] remembered that the wheat crop of last year was one of [illegible] England has had for many years. The turnips pro-[illegible] crops we have had for some time. A [illegible] pillar, attacked by that fatal disease [illegible] and stunted in their growth by the drought, [illegible] cheering prospect to the farmer. It [illegible] improvement of late in the crop; [illegible], when examined, the growth of the [illegible] to have kept pace with that of the leaves.

This is very often the case with late-sown turnips, to which class the greater part of the crop belongs this season, owing to the immense quantity that had to be sown over again after several continued attacks of the fly. Warm, moist weather, however, in autumn may still do much for the increase of this crop. The accounts of the potatoes are not encouraging. The extent to which the disease has spread among them varies in different districts; in some, report says that fully one-half are diseased, in others one-third, and in others it is only making its appearance. Where they have been lifted the crop is found to be very large. Beans are in general very short, but well podded for their bulk.

The drought has been attended with most disastrous effects abroad. In France the autumn-sown wheat has turned out an average crop in some districts, and in others much inferior; while all spring-sown crops have been quite burnt up. The cereals may, therefore, be said to be a failure. But the worst effects have been experienced in the green crops and meadows. It is literally true to say of the former that they were nowhere to be seen; while the hay from the latter has been so short that serious anxieties are felt both as to present and winter food for cattle. The consequence is, that those farmers who cannot afford to purchase substitutes for the green crops, grass and hay, have been obliged to part with their animals, for which they are too glad to get one-half of what they were worth a short time ago, and even of what the fleshers are getting for them as beef. As a substitute for the usual winter food, those who have the opportunity of preserving the leaves of trees and shrubs, are doing so in different ways; that most recommended being to make sheaves of the branches and leaves, and put them into small stacks. The air penetrates through between the branches and dries the leaves, which retain their fresh green colour and sweet smell. The extraordinary crop of fruit, however, forms a striking contrast to the deficiency of the field crops; none remembers of a finer fruit year in France. In Denmark, wheat and rye are considered good crops, while in Prussia both are said to be under an average, and the former is looked upon as a failure in Russia. In Holstein, wheat is in some instances a good crop, and in others the reverse; while rye is generally below the produce of last year. In Prussia, oats are very deficient, but in Denmark the result as to that grain is looked upon as more satisfactory. The same may be said of pease there, which, on the other hand, are a very bad crop in Holstein. The potato crop was represented in August as abundant everywhere on the Continent, though in some cases there were symptoms of disease. In America (both the States and Canada) the wheat harvest was concluded under favourable circumstances, and reports vary as to the yield of the crop; but it is generally thought that there will be very little for exportation after the wants of the home-

population are supplied. The spring crops, oats and barley, i Canada, in particular, have been destroyed by the grasshoppers.

Societies.—The whole interest of the agricultural body durin the last quarter has been absorbed by the shows of the thre national agricultural societies, and one or two important distric societies in the three kingdoms. And these have been more tha usually successful in the number and quality of the stock, and i the excellence of the implements exhibited. It would be invidiou here to make any comparison between the three national show but we cannot refrain from alluding to what has given great satis faction both to the public and exhibitors, and has been productiv of much good in the improvement of implements and machine We mean the plan adopted and carried out by the Royal Agri cultural Society of England in judging the implements. Instea of hurrying through all the classes of machines and implement every year in a limited time, so many classes are selected ever year, abundance of time and every facility given for trying them well, and the judges are most exemplary in patience and painstakin in the trial. It is no wonder, then, that an award of a premium t an implement or machine, by this society, carries more weight tha that of any other. The success of the show at Chester would lea us to suppose that the English society is gaining fast the confidenc of the public. The handsome subscription collected in the distric for the purposes of the show, and the immense crowds whic flocked from all parts of the country to the yard, swelling at th same time the collection at the doors, were no bad criterion of it popularity; and the animals and articles exhibited, while the tended to bewilder one with their numbers, were a treat in ever respect rarely met with. The banquet was also much enlivene by some good speaking, particularly by that of Mr Gladstone. I is seldom that the subject of agricultural education is handled i the way he did it; and the rapt attention with which he was lis tened to, and the great cheering which greeted the felicitous ex pression of his sentiments on the uses of these national agricul tural societies, more particularly in connection with educatio showed that he carried his audience with him.

The Highland and Agricultural Society's show at Aberdeen thi season was one of the most successful that has been held under it auspices. The exhibition of implements was particulary good and it is to be regretted that, owing to the day of meeting bein put back to the most inconvenient time of the year for farmer many were deprived of the opportunity of inspecting such a fir display of implements and machines. A distinguishing feature i this show, as compared with that in Glasgow last year, was th great increase in the implement department. We are naturall led to inquire into the cause of this. Why should English impl ment manufacturers be at the trouble and expense of transportin

their implements and machines so much farther to Aberdeen than to Glasgow, where the show of them was notoriously meagre? The answer is, that there was no English show this year to interfere with the Highland Society's, while last year the exhibition of the Yorkshire was held in the same week as the Glasgow show, and the English implement-makers unequivocally decided in favour of the Yorkshire, by not exhibiting, or at all events sending but a few of their articles to Glasgow. The Yorkshire show interferes in another important part of the exhibition with that of the Highland Society—viz. the exhibition of short-horns, many of the breeders of which are in that county, and of course prefer the shows of their own district. It is worthy, therefore, of the attention of the Directors of the Highland Society, before returning to the days on which the show was formerly held, to consider whether it would not be advisable to make some arrangements with the Yorkshire Society, by which the two shows could be held in future in different weeks. It would be well also if the trials of implements were carried out in the full manner done with that of thrashing-machines this year; short and incomplete trials produce but capricious decisions. The lecture of Professor Anderson on the "Recent Progress of Scientific Agriculture," at the show at Aberdeen, supplied the place of the brilliant speech of Mr Gladstone at Chester. In fact, his introductory remarks were very much devoted to showing, as Mr Gladstone did, the use of these national agricultural shows in noting the progress of agriculture. He then brought clearly before the meeting all the recent investigations into the subject of ammonia, and nitric acid as contained in rain, and as valuable to the agriculturist, by Barral, Boussingault, Liebig, Lawes and Gilbert. The lecture contained some valuable hints to the farmer, and was replete with instruction.

The Directors of the Royal Agricultural Improvement Society of Ireland have much reason to congratulate themselves on the continued progress of their society, as evidenced in their show this year. And the liberality of individual members in offering valuable cups to be competed for annually, while it adds considerably to the excellence of the show, in bringing forth many first-rate animals and implements, must tend to improve the animals and implements in Ireland, in that class for which the cups are offered. And though these may be gained and held by parties out of the kingdom for some years, the Directors are wise in encouraging any practice which will induce the first breeders and implement-makers to exhibit the results of their ingenuity and skill at the show, the effect of which will be to stimulate the farmers and mechanics of Ireland to the improvement of these particular classes. We are happy to be able to mention that two cups have been gained by Mr Douglass, Athelstaneford Mains—the first,

or Purcell cup, for "the best animal in the neat-cattle classes, possessing more merit of its kind in the estimation of the judges;" the second, or Waterford Challenge Cup, for "the best lot of three horned animals, not in mixed lots, not exceeding twenty months old, having been bred by exhibiter, and *bona fide* his property." Scotchmen may be proud of another of these cups being held by one of their countrymen, viz.—the Irish Farmers' Gazette Challenge cup, gained by Messrs J. Gray & Co. of Uddingstone, Lanarkshire, for "the best general collection of implements manufactured by exhibiter, and suited for the agriculture of Ireland." The presence of the Lord-Lieutenant contributed not a little to the interest of the show, and the statesmanlike views he expressed at the banquet will increase the confidence of the public in him as the ruler of Ireland, and his own popularity as a man. Besides the national shows, there have been excellent exhibitions under the auspices of the Bath and West of England, the Yorkshire, the Lincoln, and the Glasgow Societies, some of which now rival in extent and importance more than one of the national societies.

Meteorological Society.—Recent arrangements have got the Government to recognise the existence of this society and the labours of its members. It is to continue its operations as formerly, in the way of observing and recording the instruments; and Government is to relieve it of the duty of classifying, reducing, and publishing the observations, and to take the matter into its own charge. The monthly schedules of the observations made at the different stations of the society by its members are to be transmitted to the Edinburgh Observatory, where they are to be classified by a scientific secretary. There will, by this arrangement, be a saving of about £200 to the society, and a check will be put upon the observations; for the Government secretary, if suspicious of any of the observations not being correct, or of carelessness in recording them, will have it in his power to send them back to be corrected. The observations are, we believe, to be published with the Registrar-General's reports. We have no doubt that the effect of these arrangements will be to increase the confidence of the public in the observations, and to lay the foundation for much more extensive operations. We recommend the society to the support of all agriculturists, whose interests, of all other classes, will be materially [illegible] by accurate meteorological observations.

AVERAGE PRICE OF THE DIFFERENT KINDS OF GRAIN,

PER IMPERIAL QUARTER, SOLD AT THE FOLLOWING PLACES.

LONDON.

Date.	Wheat.		Barley.		Oats.		Rye.		Pease.		Beans	
1858.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
une 5.	47	5	30	0	26	10	34	4	46	1	39	10
12.	48	2	34	10	21	10	33	2	45	2	39	9
19	46	5	31	6	29	7	32	6	42	0	38	0
26	46	7	31	2	27	2	33	4	42	10	38	0
uly 3.	46	9	31	4	28	5	32	8	44	2	37	6
10.	46	6	31	10	27	5	28	5	45	6	40	8
17.	48	10	28	1	27	3	30	6	41	6	41	2
24	49	6	29	6	30	9	32	6	48	0	45	7
31.	49	4	33	2	31	3	32	4	52	0	42	0
Aug. 7.	48	6	36	4	29	8	31	4	45	0	42	3
14	49	7	37	0	30	10	34	0	44	1	38	10
21.	48	1	35	0	29	11	34	7	45	6	38	8
28.	48	7	36	6	29	9	35	5	41	9	39	0

LIVERPOOL.

Date.	Wheat.		Barley.		Oats.		Rye.		Pease.		Beans	
1858.	d.	s.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
une 5.	45	4	31	6	26	11	30	6	46	6	42	10
12.	45	7	32	4	27	6	28	10	47	2	43	6
19.	43	10	30	6	25	8	24	5	48	6	45	8
26.	43	10	31	4	26	5	28	6	45	4	44	2
uly 3.	44	10	31	11	28	11	30	4	46	0	43	8
10.	45	10	30	4	27	6	28	8	46	6	44	1
17.	46	1	28	10	24	7	29	4	45	8	43	7
24.	46	9	29	4	28	0	30	2	45	2	42	6
31.	46	1	31	8	26	11	31	6	42	6	40	6
ug. 7.	45	5	32	6	29	0	32	2	43	2	41	4
14.	46	2	29	9	25	1	33	2	44	4	48	0
21.	45	6	30	1	26	8	32	8	42	3	45	6
28.	44	8	32	4	27	6	33	4	40	9	44	6

EDINBURGH.

Date.	Wheat.		Barley.		Oats.		Pease.		Beans.	
1858.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
June 2.	41	2	29	6	28	1	42	6	43	4
9.	40	11	28	1	27	11	41	4	42	3
16.	40	3	28	6	27	10	41	6	42	4
23	41	8	25	7	26	6	41	6	42	6
30.	41	10	25	10	27	7	41	1	42	9
July 7.	42	11	28	6	28	4	43	3	44	5
14.	43	2	28	9	28	8	44	6	45	6
21.	42	3	28	5	28	7	42	10	43	11
28.	42	9	29	10	28	6	44	2	45	6
Aug. 4.	43	5	28	8	28	5	44	6	45	4
11.	43	6	28	4	27	9	47	1	48	3
18.	43	8	30	8	27	9	46	6	47	6
25	43	6	30	4	27	7	48	2	49	6

DUBLIN.

Date.	Wheat, p. barl. 20 st.		Barley. p. barl. 16 st.		Bere, p. barl. 17 st.		Oats, p. barl. 14 st.		Flour, p. barl 9 st.	
1858.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
June 4.	27	1	16	6	15	2	16	6	16	4
11.	26	9	16	1	15	0	16	5	16	2
18.	26	0	14	9	14	2	15	3	16	1
25.	25	10	15	7	13	10	15	2	16	0
July 2.	25	6	14	9	13	6	15	6	15	10
9.	26	3	14	11	13	8	16	0	15	9
16.	26	0	15	4	13	10	16	0	15	10
23.	26	2	16	1	14	4	16	4	16	0
30.	26	0	16	6	14	8	16	0	15	11
Aug. 7.	26	0	17	6	14	10	15	9	16	2
14.	25	6	16	6	14	6	16	0	15	10
21.	25	6	15	0	13	6	15	6	15	9
28.	24	5	15	2	13	7	15	3	15	8

TABLE SHOWING THE WEEKLY AVERAGE PRICE OF GRAIN,

Made up in terms of 7th and 8th Geo. IV., c. 58, and 9th and 10th Vict., c. 22. On and after 1st February 1849, the Duty payable on FOREIGN CORN imported is 1s. per quarter, and on Flour or Meal 4½d. for every cwt.

Date.	Wheat. Weekly Average.		Wheat. Aggregate Average.		Barley. Weekly Average.		Barley. Aggregate Average.		Oats. Weekly Average.		Oats. Aggregate Average.		Rye. Weekly Average.		Rye. Aggregate Average.		Pease. Weekly Average.		Pease. Aggregate Average.		Beans. Weekly Average.		Beans. Aggregate Average.	
1858.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
June 5. ……	44	9	44	7	33	7	34	10	26	5	25	11	31	0	32	0	43	3	42	6	42	5	41	3
12. ……	44	7	44	7	33	5	34	5	26	9	26	0	33	0	32	9	44	3	42	10	42	10	41	8
19. ……	43	10	44	6	30	7	33	7	26	10	26	2	29	0	32	0	43	4	43	0	42	5	41	11
26. ……	43	0	44	3	31	1	32	11	25	10	26	3	33	10	31	8	41	3	42	11	42	3	42	2
July 3. ……	42	8	43	11	30	8	32	3	25	11	26	2	33	2	31	9	42	4	42	10	42	4	42	4
10. ……	43	4	43	8	29	11	31	7	26	3	26	3	28	11	31	0	44	8	43	2	42	3	42	5
17. ……	45	3	43	9	30	4	31	0	26	5	26	2	30	8	30	11	44	5	43	4	43	3	42	7
24. ……	46	4	44	1	29	9	30	5	27	11	26	6	35	4	31	4	44	11	43	6	44	4	42	10
31. ……	45	8	44	5	30	6	30	4	28	5	26	10	31	2	32	2	43	7	43	6	45	3	43	3
Aug. 7. ……	44	10	44	8	31	3	30	5	27	6	27	1	31	9	31	10	43	9	43	11	45	7	43	10
14. ……	45	2	45	1	31	8	30	6	28	3	27	6	35	4	32	2	43	11	44	2	46	7	44	6
21. ……	45	1	45	5	33	7	31	1	27	0	27	9	35	10	33	4	44	3	44	2	46	10	45	4
28. ……	42	6	44	11	34	6	31	9	27	10	27	11	34	0	33	11	43	8	44	0	47	8	46	0

FOREIGN MARKETS.—Per Imperial Quarter, free on board

Date.	Markets.	Wheat.	Barley.	Oats.	Rye.	Pease.	
1858.		s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s.
June ..	Danzig	38 0 - 46 6	24 0 - 30 0	15 6 - 21 0	25 6 - 30 0	36 6 - 45 0	35
July ..	Danzig	39 6 - 48 0	23 6 - 30 6	18 6 - 27 6	27 0 - 32 0	32 6 - 42 6	38
Aug. ..	Danzig	40 6 - 50 6	25 6 - 36 0	20 0 - 28 6	24 0 - 28 6	30 0 - 40 6	37
June ..	Hamburg	36 6 - 45 6	24 0 - 30 6	16 0 - 22 0	20 6 - 25 6	34 6 - 43 6	34
July ..	Hamburg	38 6 - 49 0	22 6 - 27 0	18 6 - 26 0	26 0 - 32 0	33 0 - 42 6	35
Aug. ..	Hamburg	40 6 - 51 6	28 6 - 38 0	20 0 - 27 6	28 6 - 33 0	31 6 - 41 6	38
June ..	Bremen	38 6 - 45 6	25 0 - 31 6	16 6 - 23 0	22 6 - 30 0	35 6 - 46 6	33
July ..	Bremen	41 6 - 53 6	26 6 - 32 0	20 6 - 29 0	29 6 - 41 0	40 6 - 52 0	35
Aug. ..	Bremen	38 6 - 49 0	23 6 - 30 0	18 6 - 28 0	20 0 - 36 0	42 6 - 52 0	36
June ..	Königsberg	35 6 - 46 0	25 6 - 31 6	16 0 - 22 6	24 0 - 30 0	36 0 - 46 0	33
July ..	Königsberg	40 6 - 52 0	25 0 - 32 0	18 6 - 28 0	26 6 - 33 0	42 6 - 54 0	36
Aug. ..	Königsberg	38 6 - 47 6	22 6 - 30 0	20 0 - 29 0	28 6 - 40 0	42 0 - 58 6	35

Freights from the Baltic, from 2s. 6d. to 4s. 6d.; from the Mediterranean, 8s. to 10s.; and by steamer from Hamburg, 2s. to 4s. per imperial qr.

THE REVENUE.—From 31st March to 30th June 1858.

	Quarters ending June 30. 1857.	Quarters ending June 30. 1858.	Increase.	Decrease.	Years ending June 30. 1857.	Years ending June 30. 1858.	Increase.	
	£	£	£	£	£	£	£	
Customs	6,149,349	5,879,039	..	270,310	23,606,468	22,838,794	..	
Excise	4,507,000	4,626,000	119,000	..	17,667,000	17,944,000	277,000	
Stamps	1,850,491	2,084,370	233,879	..	7,364,617	7,649,598	284,981	
Taxes	1,324,000	1,326,000	2,000	..	3,009,020	3,154,033	57,013	
Post-Office ..	675,000	765,000	90,000	..	2,845,000	3,010,000	165,000	
Miscellaneous	320,382	399,970	79,588	..	1,318,993	1,953,129	634,136	
Property-Tax	2,455,540	1,199,587	..	1,255,953	16,168,723	10,330,162	..	5,
Total Income	17,281,762	16,279,966	524,467	1,526,263	71,979,821	66,879,716	1,418,130	6,
	Deduct increase....			524,467	Deduct increase....			1,
	Decrease on the qr..			1,001,795	Decrease on the year			5,

PRICES OF BUTCHER-MEAT.—Per Stone of 14 Pounds.

Date.	LONDON. Beef.	LONDON. Mutton.	LIVERPOOL. Beef.	LIVERPOOL. Mutton.	NEWCASTLE. Beef.	NEWCASTLE. Mutton.	EDINBURGH. Beef.	EDINBURGH. Mutton.	GLASG[OW]. Beef.
1858.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.
June ..	5 6 - 7 9	6 6 - 8 6	6 0 - 8 6	6 9 - 8 9	7 3 - 8 0	6 6 - 8 3	6 0 - 7 6	6 6 - 8 0	6 3 - 8 0
July ..	5 9 - 7 9	6 9 - 8 6	6 0 - 8 3	6 6 - 8 6	7 6 - 8 3	6 9 - 8 3	6 3 - 7 9	6 6 - 8 0	6 6 - 8 0
Aug. ..	6 9 - 8 0	7 0 - 8 0	6 3 - 8 3	6 9 - 8 9	7 0 - 8 0	7 0 - 8	6 9 - 8 0	6 9 - 8 3	6 9 - 8 3

PRICES OF ENGLISH AND SCOTCH WOOLS.—Per Stone of 14 Po[unds]

ENGLISH.	s. d.		s. d.	SCOTCH.	s. d.
Merino,	16 6	to	22 6	Leicester Hogg,	16 0
.. in grease,	13 6	,,	15 6	.. Ewe and Hogg,	12 6
South-Down,	16 0	,,	22 0	Cheviot, white,	13 6
Half-Bred,	13 6	,,	18 6	.. laid, washed,	8 6
Leicester Hogg,	14 0	,,	18 0	.. .. unwashed,	7 0
.. Ewe and Hogg,	12 6	,,	16 6	Moor, white,	7 0
Locks,	8 0	,,	10 6	.. laid, washed,	6 0
Moor,	5 6	,,	7 6	.. .. unwashed,	5 0

NOTES ON NOVELTIES AT THE NATIONAL AGRICULTURAL SHOWS OF 1858.—CHESTER (JULY). *Second Notice.*

By ROBERT SCOTT BURN.

IN the first of our notices of this great Show, given in the last number of the Journal, we were compelled, through lack of space, to forego our description of the results of the trial of the steam-cultivating machines, and of the steam-engines—the thrashing and other machines worked by steam-power—promising to draw attention to these in a future number. This promise we now propose to redeem.

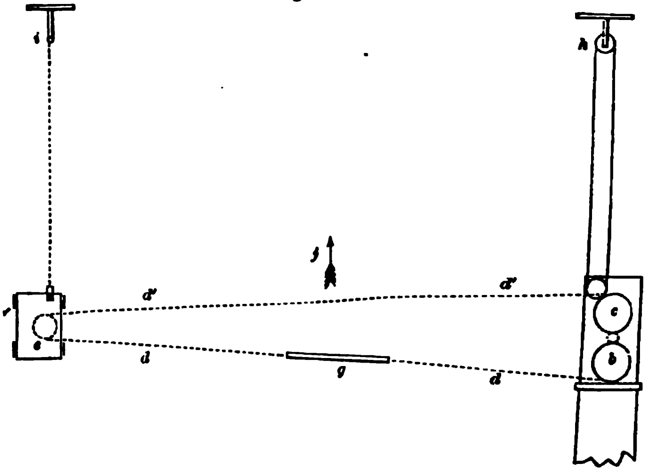
Steam-Cultivators.—For the great prize, £500—for the best steam-cultivating apparatus—four competitors were entered,—Mr John Fowler, C.E., 28 Cornhill, London; Messrs Howard of Bedford (Mr Wm. Smith of Bletchley's system); Mr Burrell of Retford (Mr Boydell's Endless Railway system); and Mr Ricketts of Castle Foundry, Buckingham.

Fowler's System.—In our article in the October number of this Journal for 1857, we illustrated and described the arrangement and mechanism adopted by Mr Fowler at the trial at Salisbury in the above year. Since that period he has succeeded in introducing several most important improvements; chief amongst these is the employment of an "endless rope," working on and off two grooved pulleys instead of two ropes, one being wound on, and the other being unwound from, a pulley, as in the mechanism of last year. The advantages accruing from this simple arrangement are very decided. The labour of coiling and uncoiling is obviated, and the risk of the rope overrunning itself during the latter operation. The wear and tear are very much, and the length, moreover, reduced from one-third to one-half of that necessitated by the old plan. The pull being also direct and steady, the rope is calculated to bear a greater strain than when used in the "coiling and uncoiling plan." The system of self-adjusting anchorage is the same as employed at Salisbury, with the exception of some improvements in the gearing, which we shall presently describe.

The diagram, fig. 1, here given, will illustrate the new arrangement now adopted by Mr Fowler. The portable engine which works the windlass is represented by *a*, *b c* the two grooved pulleys, *d d d'* the endless wire-rope passing round the pulley of the anchor *f*, *g* the plough, *h i* the anchors affording points of resistance by which the engine *a* and anchor *f* can be pulled coincidently across the field in the direction of the arrow *j*, as the plough *g* brings the land under cultivation. The wire-rope being joined by means of eyes in

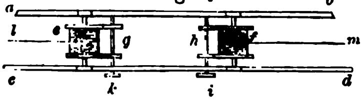
short lengths, can be adjusted to any length as desired, while mea of adjustment *during the operation of the plough* are also provid

Fig. 1.



by the arrangement adopted to secure the two ends of the rope, the mechanism of which we here describe. Let *a b*, *c d*, fig. 2, represent part of the two sides of the plough-frame; in suitable bearings attached to the upper edges of these, the shafts or axes of two small barrels or drums revolve. The flanges of these are provided with teeth, which engage with pinions—two to each barrel, hung on axes or shafts *g h*, parallel to those of the barrels *e* and *f*. These axes are produced at one side beyond the frame, and provided with hand lever-wheels *k* and *i*. The end of the wire-rope, as *l*, is secured to the periphery of the barrel *e*, and the other, as *m*, to the second barrel *f*; a considerable portion of the rope is wound round each barrel, to admit of every degree of adjustment required. By turning the hand lever-wheels *k* and *i*, the rope can be wound on, or unwound from, the barrels as desired, increasing or decreasing the length of the wire-rope with the consequent length of the "bout" or journey which the plough will take. By this means every adjustment rendered necessary by the inequality of the boundary-fences of the field in which the apparatus is at work, is easily made by the attendant who accompanies the plough-frame during its action. The ends of the rope being attached to the two barrels *e* and *f*, fig. 2, it is thus practically endless. Another advantage obtained by this arrangement is, that another implement can be used on the return rope: thus suppose, in fig. 1, the plough frame *g*, arranged as a scarifier, to have finished the "bout" along the

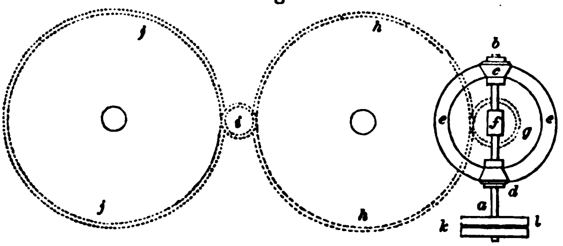
Fig. 2.



line *d d*, and to be taking the line *d′ d′*, a harrow can be placed on the line *d d*, to operate on the soil previously scarified. It is necessary to note here, that to prevent the ropes unwinding themselves from the barrels *e* and *f* (in fig. 2), ratchet-wheels are provided them, in which pawls or clicks engage. Such was the arrangement for attaching the ends of the rope to the plough first adopted by Mr Fowler; he has simplified it very much by discarding the pinions on the shafts *g* and *h*, and fixing internal toothed-wheels to the flanges of the drums *e f*, and having internal pinions worked by cross handles at the ends of the shaft.

We now describe the new windlass mechanism necessitated by the adoption of the endless-rope system. At the front of the framing carrying the engine, a cross shaft *a b*, fig. 3, is supported by two vertical standards secured to the framing. On this two bevel pinions *c* and *d* are hung: these have a motion independent of the shaft *a b*; that is, the latter is free to revolve without influencing the pinions. This takes place as long as the clutch *f* is midway on the shaft between *c* and *d*; but by moving the clutch by means of suitable levers along the shaft, till it engages with, say the pinion *c*, the pinion partakes of the motion of the shaft *a b*, and, gearing with the horizontal bevel-wheel *e e*, gives motion to it in one direction; by sliding the clutch *f* out of gear with *c*, and into gear with *d*, motion is given to the wheel *e e* in the opposite direction. The direction of motion of the wheel *e e* is thus easily capable of change. We have now to point out how it influences the two drums or grooved pulleys *h h* and *j j*, round which the endless wire-rope is passed. To the shaft of the horizontal wheel *e e* a toothed pinion is provided; this gears with a spur-wheel fixed in the lower part of the drum or pulley *h h*; this pulley *h h* engages in turn with an intermediate pinion *i*; and this finally gives motion to the second pulley or drum *j j*. By the employment of the intermediate pinion *i*, the motion of the two drums *h h* and *j j* is always in the same direction. The shaft *a b* is provided with fast and loose pulleys *k* and *l*, round which a belt from the driving-pulley of the engine passes, and which, by means of a fork, is made to pass either from the fast to the loose pulley, or *vice versâ*, stopping the motion of, or giving motion to, the shaft *a b*.

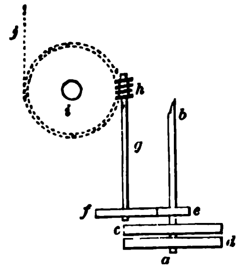
Fig. 3.



The mechanism by which the engine and windlass *a b c*, fig. 1, are hauled up to the fixed anchor *i*, fig. 1, is of simple

character, and will be easily understood by a referen*ce to the* following diagram.

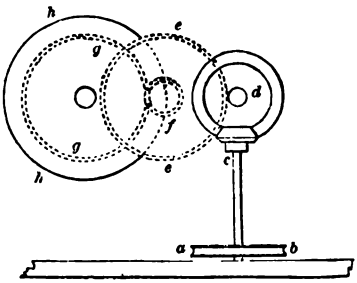
Fig. 4.



Let *a b c d*, fig. 4, represent *the* shaft with its fast and loose pulleys *c* and *d* corresponding to *a b*, fig. 3, *with* its fast and loose pulleys *k* and *l*; to this a pinion *e* is provided, engaging with a spur-wheel *f*, keyed on the end of a shaft *g*, parallel to the shaft *a b*. At the end of this shaft *g*, an endless screw *h* is provided; this engages with the skew teeth of the wheel *i*, fixed on the shaft of a barrel round which a wire rope *i i* is passed; this is led out towards the anchor *i*, fig. 1, passed round its pulley, returned to the windlass, and fixed to the framing of the engine. The wheel *f* is capable of being put in and out of gear with the pinion *e* by means of a sliding-clutch.

The gearing of the self-adjusting anchor remains now to be described. Let *a b*, fig. 5, represen a grooved horizontal pulley, revolving in bearings attached to th framing of the anchor. This shaf carries a horizontal bevel-wheel *c* engaging with two vertical pinions one at opposite ends of the diamete of horizontal wheel *c*, keyed on horizontal shaft; this, by means a spur-pinion, gives motion to th spur-wheel *e e*, on the axis of whic is a pinion *f*, engaging with th teeth of a second spur-wheel *g g*, the shaft of which carries a vertic drum or grooved pulley *h* round which the wire-rope is coile (In the sketch, the relative sizes of the wheels *c d* should be r versed; *c* should be the large horizontal wheel, and *d* one of t small pinions gearing with it.) This rope is attached to the fix anchor *i*, fig. 1; and as the pulley *a b*, fig. 5, is made to revolve b the action of the plough traction-rope passing round it, it giv by means of the reducing gear a slow motion to the drum *h*, rou which the rope is slowly wound, gradually pulling the "self-adjus ing anchor" up towards the fixed anchor *i*, fig. 1, the disc-whe of the anchor cutting their way deeply into the soil, and affordi for the wire traction-rope a good point of resistance. This "se adjusting anchor" is one of the most effective features of Mr Fowle apparatus, and fully deserves the high praise it has obtained fr all parties as an ingenious and efficient piece of mechanism.

Fig. 5.



Mr Fowler's apparatus here described was tried at Chester, un

ɜ inspection of the judges—Professor Wilson, of the Chair of Agri-lture, Edinburgh; Mr Druce, Eynsham, Oxon.; John Clark, Long tton; and George Shackel, Earlsey Court, Reading—in two classes soil: 1st, For the ordinary ploughing on a field of two-year-old ·ds, the soil a light sandy loam upon a subsoil of silt or sand, ɜ surface offering considerable resistance, being "firmly bound gether by a luxuriant growth of couch and other grasses," and pre-nting a "fair trial ground" for two-horse work; 2d, For plough-g and trenching on a soil a strong tenacious loam, "in a very y and indurated condition, and matted together by a strong owth of thistles and grasses." The following, from the Report of ɜ judges, is an estimate of the daily working expenses of the appa-us, the quantity of work done, and the estimated cost per acre of ɜ same.

DAILY EXPENSES.

Engineer,	£0	5	0
Plough and anchor men,	0	6	0
Two boys,	0	2	0
Water-cart,	0	5	0
Coals, 10 cwt.,	0	10	0
Oil, &c.,	0	1	0
Removal,	0	4	0
Interest at 5 per cent, and wear and tear at 15 per cent on first cost, £650: assuming 200 as the number of working days in the year,	0	13	0
	£2	6	0

The work performed on the light land, including stoppages, was the rate of $7\frac{3}{4}$ acres per day of ten hours; 3.83 feet per second s the actual rate of travelling, giving per hour 1.031 acres, the l moved with the four ploughs being 3 feet 4 inches wide by 6 hes deep; 4 acres, 3 roods, 12 poles were ploughed in the heavy d in 9 hours 39 minutes, equal to 5 acres a-day. With Col-ave's trenching plough, taking a furrow 12 to 14 inches deep, the adth turned over with two ploughs 20 inches, the work done s $2\frac{1}{2}$ acres per day. Upon these data the judges founded the owing estimate as to cost of the operations per acre:—

Of light land,	£0	6	0
According to the rate of work done in the trials, or taking six acres per day as the average, at	0	7	2
Of heavy land,	0	9	2
Of trenching ditto,	0	18	4

"Our estimate," they remark, "of the quality and value of the ·k thus performed, is, that the light land could not have been ıe by horse-power for less than 8s. per acre; that the heavy land ld not have been ploughed by horse-power for less than 12s. 6d. acre; and that the trenching could not have been done by horse-ver at all; and that by manual labour with the spade and grub-

bing tool, it could not have been done for less than 10d. per pole, or £6, 13s. 4d. the acre, and then only in an inferior manner."

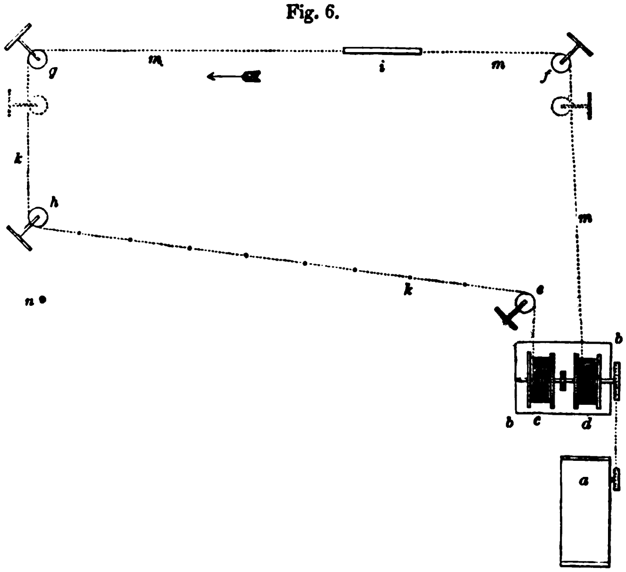
Respecting the practical value of Mr Fowler's plan, we last year gave the following opinion :—" Of all the plans yet introduced, this of Mr Fowler's is the most likely to succeed, and presents at all events many features of business-like utility. Mr Fowler has done more, we think, in steam-ploughing, and on a commercial basis—that is, ploughing by contract—than all the others put together." The result of this year's trial of the apparatus at Chester justifies this good opinion, Mr Fowler having, with the *unanimous* decision of the judges, been awarded the £500 prize.

Mr Smith of Bletchley's System.—It is now our duty to describe the features of the other system of steam-culture, to which the judges had to give their attention, this being the system of Mr Smith of Woolstone, Bletchley. As is pretty well known to those "up" in matters connected with agricultural progress, Mr Smith discards the time-honoured plough, and uses implements resembling in appearance, but differing, as he says, essentially in character of operation, from the tined grubber, scarifier, or cultivator. At Chester, the field operation gone through on this system, under the care of Messrs Howard of Bedford, who produced the mechanism, was of a twofold character; *first,* Going over the land with a three-tined cultivator, which penetrated the soil to a depth of from 6 to 7 inches, cutting it up in strips as it were, but changing to a very slight extent the original appearance of the land before being operated upon; *secondly,* By crossing the work thus done by a five-tined cultivator, working at the same depth as the three-tined one formerly used, and which, reversing the whole of the top soil, exposed a rough irregular surface to the ameliorating influence of the atmosphere.

The arrangements and the mechanism by which these operations were carried out we shall now endeavour to explain. In fig. 6 let *a* represent the engine which works the windlass *b b*, of which *c* and *d* are the drums on which the wire traction-rope which works the cultivator is wound, and from which it is unwound alternately. The wire-rope is led out from the windlass over the pulley *f*, attached to the cultivator *i*; from thence over the pulley *g*; thence to the pulleys *h* and *e*; and finally attached to the drum *d* of the windlass *b b*. Rollers, as shown by the points on the lines of ropes, are used, round which the rope is passed to keep it from the ground, and to abate its friction. The pulleys *e f g* and *h* are all anchored firmly by means of curved tines or teeth, which take fast hold of the soil, and dig the deeper therein the more the engine exerts a drag on them. The flanges of the two drums *c* and *d* of the windlass *b b* are provided with toothed wheels, with which engages a pinion hung on a transverse shaft placed above the drums; by means of a sliding

clutch the pinion is made to engage alternately with the spur-wheels on the drums. This transverse shaft is provided with a pulley, which

Fig. 6.



is driven by a band from the driving-drum of the engine. The drums are provided with brakes to regulate their motion. The following is the operation of the apparatus, as illustrated in fig. 6: Suppose the cultivator to be going in the direction of the arrow, the drum *c* is hauling in the wire-rope *k k*, the drum *d* paying out the rope *m m*. On the cultivator *i* reaching the end of its bout near the anchor *g*, the engine is stopped by a signal, the direction of motion of the drums *c* and *d* is changed, and the anchor-pulley *g* removed to a point nearer *h*—say to the point indicated by dotted lines—this distance being equal to twice the breadth which the cultivator turns up at one time. The cultivator is now reversed in position; the drum *d* hauls in the rope *m m*, the drum *c* giving out the rope *k k*. The processes are thus repeated till the anchor-pulley *g* is brought up to the position of that at *h*; *h* being at this stage of the proceedings moved to a point opposite the anchor-pulley *e*, as at *n*. The whole of the space between the points *f* and *g* is thus cultivated. Mr Smith finds a convenient distance between *f* and *g* to be about one-eighth of a mile; and a space of from 10 to 12 acres a convenient-sized piece of land to set down to. The engine and windlass are supposed to be set down in the centre of the field, the right-hand piece being first cultivated, the left-hand one being done last, the anchors for this being reversed in position.

As before noted, the implements used by Mr Smith resembl appearance the ordinary grubber; their action is, however, diffe "They are no more," says Mr Smith, "like an ordinary cultiv scuffler, or scarifier, than the blade of one ship's anchors are li great stone tied by a string to keep a boat to the side of a p My steam-plough is, in point of fact, three of the best-formed tract that I can find, braced together with iron enough to support strain upon them." Their tendency is to sink into the soil, not out of it, as is that of the ordinary grubber, according to Mr Sn In the three-tined cultivator of Mr Smith, the tines are pl thus, °₀°; in the five-tined, °₀°₀°. The frames of both implem run in, and are supported by two wheels, adjusted in the ma usually adopted in wheel-ploughs. In addition to these, two gu wheels are provided; these are carried in a cross stud, the cen pin of which passes through an eye made at the end of a b which projects from the main framing. The upper end of the is provided with a cross, the ends of which are embraced b forked lever, which is carried backward, and terminates between stilts or handles at a point within easy reach. This lever rests a flat bar notched in its upper side, and supported by two vert uprights bolted to the sides of the main framing at a point near handles; by moving the lever into the notches on either side, cross carrying the guide-wheels is moved from side to side, and implement guided accordingly. The implement used by Mr Sn for trenching and subsoiling, differs from the five-tined cultiv only in having the two front tines taken away and a double-mo board plough-frame substituted, the coulter of which is carried by beam, and in having an additional pair of wheels on which to r the implement at the land's end. These wheels are hung at the of levers fixed to the end of a cross shaft supported on bearing the back of the frame, the cross shaft being worked by a l handle within easy reach of the attendant. By moving this ha the wheels can be brought in contact with the ground, and the plement raised as desired. The subsoil plough also employed Mr Smith is a cultivator with one tine, calculated to work after trenching plough above described, to cut the land in slices 15 t inches wide.

At the trial at Chester, the three-tined cultivator went ov acres 3 roods (taking a breadth of 20 inches) in 10 hours 37 minu this being covered with the five-tined cultivator, taking a bre of 48 inches, in 4 hours 50 minutes (4 acres 3 roods 33 po thus giving a result of work completed by the two operatio about 5 acres in 15 hours, or 3½ acres per day. The judges the following as the estimate of daily expenses:—

Engineer,	£0	5	0
Four men in the field,	0	10	0
Boy,	0	1	0
Water-cart,	0	5	0
Removal,	0	4	0
Coals, 10 cwt.,	0	10	0
Oil, &c.,	0	1	0
Interest, 5 per cent; wear and tear, 20 per cent on first cost, £430, taking 200 as the number of working days in the year,	0	10	9
	£2	6	9

" This shows," the judges remark, "that the work was done at a st of 14s. per acre; while to effect a similar result with the ordi-ry implements and horse-power, three distinct operations would required, which would not be performed at less than 18s. 6d. r acre.

Since the Chester Show-trial Mr Smith has kindly furnished us th the results of the system he has introduced, on the two pieces land in his farm which have been the longest under its influence. ıe tables show the results since the commencement, and are cal-lated to show the practical reader of what the system is capable. ually good results have been obtained from other parts of the m more recently put under steam-tillage. The fields to which e tables refer are, it should be noted, both heavy clay-land, not an at starting.

No. 1.

		Per Acre.		
1856. March.	Steam-ploughed twice, at a cost of	£0	10	4
	Scuffled once with horses,	0	2	0
	Wear and tear of machinery,	0	3	0
		£0	15	4
	Crop—Drilled Pease. Produce per acre, 41 bushels.			
1856. Sept.	Steam-ploughed *once*, at a cost of	£0	5	2
	Scuffled twice with horses,	0	4	0
	Wear and tear,	0	1	6
		£0	10	8
	Crop—Drilled Barley in April 1857. Produce, 56 bushels per acre.			
1857. Sept.	Steam-ploughed once at a cost of	£0	5	2
	Scuffled once with horses,	0	2	0
	Wear and tear,	0	1	6
		£0	8	8
	Crop—Drilled Beans. Crop very good for the year, but not yet (November 11) thrashed.			
1858. Sept.	Steam-ploughed once at a cost of	£0	5	2
	Scuffled once with horses,	0	2	0
	Wear and tear,	0	1	6
		£0	8	8

Now drilled with wheat, and as clean as a garden.

The total cost per acre of steam-tillage for four years is thus shown to be £2, 3s. 4d., giving a yearly average of 10s. 10d. The following shows the results of No. 2 :—

		Per Acre.		
1856.				
Jan. 7.	Steam-ploughed once at a cost of . . .	£0	5	2
	Wear and tear, ...	0	1	6
		£0	6	8
	Crop—Drilled Beans. Produce, 51 bushels per acre.			
1857.				
Sept.	Steam-ploughed once at a cost of . . .	£0	5	2
	Scuffled once with horses, ...	0	2	0
	Wear and tear, ...	0	1	6
		£0	8	8
	Crop—Wheat. Produce, 56 bushels per acre.			
1858.				
Nov.	Steam-ploughed once, at a cost of . . .	£0	8	8
	Subsoiled once with horses, ...	0	3	0
	Wear and tear, ...	0	1	6
		£0	13	2
	Turnips and mangold ; the finest by far in the neighbourhood.			

Boydell's Endless Railway System.—The plan entered for trial by Mr Charles Burrell of Thetford consisted in the adaptation of Boydell's traction-engine to the haulage of a frame supported on three wheels, and carrying a plough with six mould-boards, each provided with an adjusting lever, by which it could be taken out of work and adjusted as desired. The whole arrangements were characterised with more of a business-like utility than they presented at the Show at Salisbury last year, and the work performed was in every way more satisfactory. From a variety of unfortunate circumstances, the apparatus was disqualified for competition.

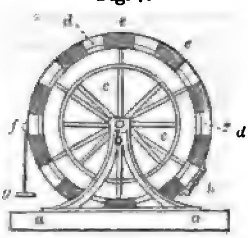
Mr Ricketts' Portable Steam-Cultivator.—The plan of Mr S. Ricketts of Castle Foundry, Buckingham—the fourth entered, but also, unfortunately, disqualified for competition—deserves notice from its novelty, and as being an example of the system of rotatory cultivation, in which the steam-engine and the cultivating implement move together over the land to be ploughed. The main feature of Mr Ricketts' invention consists in the employment of a transverse shaft at the back or fire-box end of the portable engine to which it is attached, and to which motion is given by a gearing-chain from a shaft actuated by the engine. The direction of motion of the transverse shaft is the same with that of the progressive motion of the engine. The shaft is provided with a series of cutters or tines, which, as the shaft revolves, enter the soil from below, and work upwards towards the surface, carrying with "them the separated pieces, and drop them as their revolution is continued in an inverted position. This," continues the judges, who remark on the nature of the invention, "is a new principle of

action in rotatory cultivation. It substitutes a tearing for a compressing force in dividing the soil, and completes the inversion of the separated pieces by moving through half a revolution (or an angle of 180°), instead of three-quarters of a revolution (or an angle of 270°), which is required by the ordinary mode of applying rotatory cultivation."

The engine advancing at the rate of 20 feet per second, and the cutter-shaft making 75 revolutions per minute, 91½ poles per hour, or 5¾ acres per day, can be cultivated, the cutters taking a slice of 7 feet in breadth by 6 inches deep and 4½ inches wide. Taking the working expenses at 35s. 9d., the cost per acre may be set down at 9s. Short as was the trial, enough, according to the judges, was done to "show that the principle of rotatory cultivation had taken a distinct position as a desirable and valuable addition to the mechanics of agriculture."

Steam-Engines.—The next important department of the Chester Show to which our attention shall now be directed is that of the steam-engines, "fixed" and "portable," of the latter class of which fourteen were "tried" for the prize, and of the former nine. The following is a description of the dynamometer employed to test the "efficiency" of each engine tried, or the rate of "duty" performed by it. *a a*, fig. 7, is the base supporting the pedestal *b*, affording a bearing for the shaft which carries the pulley *c c*, and the large wheel *d d*. This friction-wheel is provided with an iron strap and friction-blocks *e e*. The pulley or drum *c c* is placed in connection with the driving-drum of the engine to be tested by means of a driving-band or belt, and the friction-strap of the wheel *d d* tightened up by means of a pinching-screw at *h*, so as to keep the weight in the dish *g* suspended by the rod—connected at its upper end with the strap of the friction-wheel *d d*—exactly balanced, and the pointer, which is connected with the strap at the point *f*, exactly in a line with the centre of the shaft. The whole power of the engine is thus absorbed in driving the pulley, the motion of which is retarded by the friction between the periphery of the friction-wheel *d d* and the friction-block *e e*, this friction being sustained by the weights in the dish *g*. The weight is therefore a measure of the power of the engine, and varies according to the power of the engine which is being tested, and the number of revolutions it makes per minute. The number of revolutions which the wheel and pulley of the dynamometer makes during the working of the engine is registered by a counter attached to the dynamometer. Fourteen pounds of coal for each horse-power is allotted to the engine-man, whose duty it is to get as many revolutions out of the engine as possible, the number of these being noted

Fig. 7.



by the judges, and also the time during which the engine continues to work. According to Mr William Walker, who read valuable papers on steam applied to agriculture before the Institution of Mechanical Engineers, the weight to be placed in the dish *g*, fig. 7, is calculated by the formula, where H P is the horse-power of the engine; *d* the diameter in feet of the pulley *c c*, fig. 7, which is 3 feet 6 inches; *c* the circumference of the circle, of which the radius is a distance equal to that from the pointer, which carries the rod *f* and dish *g* to the centre of the friction-wheel *d d*; *d* the diameter of the driving-pulley of the steam-engine to be tested; and *n* the number of revolutions which it is entered to make per minute. Thus—

$$\frac{\text{H P} \times 33.000 \times d}{\text{C} \times \text{D} \times n} = \text{W},$$

which represents the weight to be placed in the dish *g* of the dynamometer. The minutes of duty which the engine under trial has done are ascertained by dividing the number of revolutions of the dynamometer—registered by the counter—by a divisor obtained by multiplying the diameter of the driving-pulley of the engine by the number of revolutions it takes per minute, and dividing the sum by the diameter of the driving-pulley *c c* of the dynamometer. Converting the minutes of duty thus obtained into hours and decimals, and dividing it into the heat of coal supplied, gives the "duty"—expressive of the coal consumed per hour per horse-power. Thus the duty performed by Tuxford's engine, which took the prize, is equal to little more than 3 lb. of coal per hour per horse-power—a very high rate of duty as compared with many engines in the manufacturing districts. The weight in the dish *g*, fig. 7, multiplied by the circumference of the friction-wheel (D in the formula given above), multiplied by the diameter of the driving-pulley of the engine, and again by the number of revolutions it makes per minute, the result, divided by the diameter of the pulley *c c* of the dynamometer, gives the number of pounds raised one foot high by the engine, which, divided by 33,000, gives the horse-power of the engine under trial—the pressure of steam not to exceed 45 lb. to the square inch.

The exhibitors entering portable and fixed steam-engines for trial had to abide by the following conditions: For portable engines of 8-horse power the diameter of cylinder was not to exceed 9¾ inches; above 8, and not exceeding 12, two cylinders not exceeding 8 inches in diameter. The exhibitors to furnish to the Society specification of the boilers, along with drawings of a longitudinal and sectional plan, showing the action of the fire upon the flues, and, in addition, the following particulars: (1.) The thickness and quality of the boiler-plates; (2.) The diameter of cylinder; (3.) The length of the stroke of piston; (4.) The number of revolutions, and the

diameter of the crank and crank-shaft, both of which must be made of wrought-iron; (5.) Diameter and weight of fly-wheel; (6.) The diameter of the driving-pulley, which must not be less than 6 inches wide, nor move at a less velocity than 1600 feet per minute; (7.) The number of horse-power the engine is calculated to work at.

The tubes in the boiler not to be less than 2½ inches diameter inside measurement, nor less than No. 12 of the "metal gauge" in thickness. The distance between the tubes not to be less than 1 inch. The tube-plates to be of either "Lowmoor" or "Bowling" iron, with the trade-mark of the company on each plate.

The engine to be provided with a good water-gauge, and with a stout piece of pipe tapped to fit the junction of a pressure-gauge. The force-pump not to have more than two valves; and where a "heater" is used, it must be so constructed that the engine will work independently of it.

After the engine has been set to work for a short time, with steam of a pressure of 45 lb. to the square inch, it will be stopped, and suffered to cool down. "The exhibitor will then be required to enter the engine—in the presence of the judges—and to withdraw the piston, slide, expansion-valve and pump-valves, for examination. Two men only will be allowed to assist in the operation, and the time of taking to pieces and replacing the parts will be noted. When the whole is put together, the engine will undergo the trial of working in the ordinary manner."

In "fixed" steam-engines the conditions of trial were as follows: The power (nominal) of engines entered not to exceed 10 horses, the diameter of cylinder not more than 11½ inches. The exhibitor to supply the Society with plans and specifications of the boiler employed by him, such boiler to possess a capacity of 25 superficial feet of effective heating surface, and ¾ of a foot of effective fire-grate for each nominal horse-power of the engine. No tubes of tubular boiler employed are to be less than 2½ inches inside measurement, nor less in thickness than No. 12 in the metal-gauge.

The following tables will display the results of the trials:—

STEAM-ENGINES.

Eight-horse Portable.

Name.	Address.	Time Run. Ho.	Min.
Brown & May	Devizes, Wilts	2	35
Messrs Fowler & M'Collin	Kingston-upon-Hull	1	43½
William Butlin	Northampton	1	14½
J. Haywood, jun.	Derby	2	0
Wm. Foster	Lincoln	1	30
Tuxford & Sons	Boston	3	35
Clayton, Shuttleworth, & Co.	Lincoln	3	7
Hornsby & Son	Grantham	2	40
Ransome & Sims	Ipswich	2	35

Twelve-horse Portable.

Name.	Address.	Time Run. Hr.	Time Run. Mn.
Tuxford & Sons	Boston	2	57
Clayton & Shuttleworth	Lincoln	2	41
Hornsby & Sons	Grantham	2	25
Ransome & Sims	Ipswich	2	29

Fixed Engines.

Name.	Address.	Time Run. Hr.	Time Run. Mn.
Oliver Maggs	Bourton, Dorset, N. Winchester, Somersetshire	1	28
E. & B. Johnson	Flookersbrook Foundry, Chester	1	54
Ransome & Sims	Ipswich	2	7
W. H. Nash	Isle of Dogs, Poplar, London	1	25
Messrs Brown & May	Devizes, Wilts	1	45
Thos. Ferrabee & Co.	Phœnix Iron-Works, Strand	2	2
Hornsby & Sons	Grantham	2	9
Clayton & Shuttleworth	Lincoln	1	54
Barrett, Exall, & Andrews	Reading	3	0

Thrashing-Machines.—In testing the merits of the combined thrashing-machines for preparing corn for market, the judges gave due consideration to the "points" which should denote perfect work, and of which the following is a statement: "Clean thrashed," 100; "clean shaken," 70; "well dressed," 70; "cavings free from corn," 70; "chaff free from corn," 50; "chaff free from cavings," 20; "corn uninjured," 50; "barley hummelled, straw unbroken," 20; "chaff free from seed," 20. The time taken in thrashing 150 sheaves of wheat was noted—the horse-power, the portability, price, simplicity, and excellence of construction. The highest number of points which any machine tried could attain was 470; such, however, was the deficiency in all tested, some in one point, some in another, that the best only reached to the dignity of 425 points. "In what particular respects," asks a reliable authority, "will it be supposed, are machines generally found defective? We are informed," he continues, "that of sixteen machines only one knocked out the corn cleanly, and six nearly so; only one thrashed without injuring the grain, and ten nearly so; not one produced the straw quite unbroken, but twelve nearly so; not one could shake the straw perfectly clear of corn, and only six nearly so; not one riddled without carrying over corn among the cavings, and but five nearly so; not one had the chaff free from seeds, but four nearly so; not one machine dressed the corn perfectly, and only two nearly so; four blew out their chaff free from corn, and eight nearly so; while three produced chaff clear of cavings, and five nearly so. That is, the general performances of thrashing-machines rank in merit as follows:—Chaffing, and producing whole straw, are done the best; next, the corn uninjured; only half the machines are respectable in clean thrashing, and nicely separating the cavings from the chaff; scarcely more than a third

ver the cavings without wasting a great deal of corn; a fourth he machines make chaff tolerably free from seeds, and less than fifth of them do the finishing, dressing it all well."*

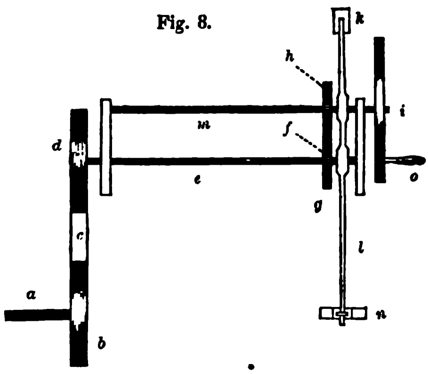
n trying the machines, the engine used as the motive power was lied through the medium of a dynamometer of a somewhat comated character. It is impossible fully to describe this instrut without full drawings. The following description will pers give the reader some notion of its mode of working. The t of the dynamometer carried two driving-pulleys of equal diaer; these did not revolve independently, but were connected n each other by spiral springs, the ends of which were fastened to bosses of the wheels, and the other ends to the rims, the spring he one wheel being fastened to the rim of the other. The ngs were not coincident in direction, but were placed in oppo positions, one being turned to the right, the other to the left. have said that those two pulleys were hung in the shaft of the amometer; but this shaft was of a double character, the shaft which one pulley was fixed being a solid shaft, passing through llow shaft, in which the other pulley was secured. Round the ey in the solid shaft the belt from the driving-pulley of the m-engine was passed; round the other pulley the belt was sed which gave motion to the driving-drum of the thrashinghine under trial. A train of wheels connected with a counter stered the number of revolutions of the dynamometer shaft, and e motion to a drum, round which a long slip of paper was coiled, which a pencil, worked laterally out and in, traced a zigzag line he coil of paper was slowly unwound from the drum or cylinder. ion was given to the pencil as follows: The motion of the ine and of the pulley on the solid shaft of the dynamometer, ch received its motion, being uniform, and that of the drum of thrashing-machine under trial, and by consequence of the pulley he hollow shaft of the dynamometer, being varying, as the chaer of the work performed by it varied in intensity of force reed to perform it, a twisting movement of the two pulleys resulted, ling to collapse and extend their attached spiral springs. This lted in giving the hollow shaft of one pulley a tendency to slide g the solid shaft, to and from the pulley fixed thereon; by a ple clutch this movement of the hollow shaft was transferred to pencil; which, as it worked from side to side, traced a zigzag on the slip of paper. The diagram thus obtained showed the tion between the uniform motion or intensity of the pulley on fixed shaft, driven by the steam-engine, and the varying motion ntensity of the pulley on the hollow shaft, and which gave motion he driving-pulley of the thrashing-machine under trial. The lt of the four machines selected for the final or great trial was

* *Mark Lane Express.*

as follows: 1st, Clayton & Shuttleworth; 2d, Hornsby & Son; 3d, Ransome & Sims; 4th, E. & T. Humphries. The comparative times of doing the allotted work being, 1st, 44¼ minutes; 2d, 44¾ minutes; 3d, 46½ minutes; and 4th, 61 minutes.

The *Straw-cutters*, *Root-cutters*, &c., the class of machines which next claim our attention, were tested by a dynamometer, the arrangement and operation of which may be understood by the following:

Fig. 8.



Let *a*, fig. 8, represent the shaft of the machine, as a straw-cutter, the operation of which it is required to test. To this a pulley *b* is fixed, the driving-belt of which passes over pulley *d* of the dynamometer, which is brought up to the machine to be tested. The end *f* of the shaft *e*, on which the pulley *d* is keyed, passes into an oblong slot or mortise-hole in the lever *l*; by this arrangement the end *f* of the shaft *e* has a certain amount of play or traverse in a vertical direction allowed to it. The lever *l* has its centre of vibration in the shaft *m*, and is connected by a weight *k*, which is so adjusted, that when the machine is at rest the lever *l* and the wheel *g* are balanced, and the end *f* of the shaft *e* rests unsupported or balanced in the slot or mortise-hole. On the shaft *m* a spur-wheel is fixed, gearing with another *g*, of same size and pitch, on the shaft *e*. To *m* a fly-wheel *i* is keyed in, worked by a handle *o*, the radius of its leverage *i o* being equal to the radius of the pulley *d* or *b*. By this arrangement, the force required to turn the pulley *b* of the machine under trial, is transferred to, or must be overcome by, a force applied to the lever *o* of the fly-wheel *i*. On turning the fly-wheel, the tendency of the machine under trial is to prevent the wheel *g* and shaft *e* from revolving, and to lift *g* up, through the medium of the wheel *n*, raising the end *f* of the shaft *e* in the slot of the lever *l*, and raising the end *k*, in which weights are placed, sufficiently to bring the end *f* down in the slot, and allow the two wheels to revolve. The weights thus obtained at the end of the lever *l* is a measure of the force which the machine under trial takes to work it, and which is represented by so many pounds lifted one foot high per minute. The number of revolutions are registered by a counter attached to the framing of the engine.

In testing the straw-cutters, the length of "cut" to be given by each was limited to three-eighths of an inch. The machines worked by hand were limited to the following speed:—42 revolutions per minute for a 12-inch winch-handle or crank; 37 revolutions for

·inch, and 32 revolutions for a 16-inch lever. Each machine s also required to be fitted with a pulley of same radius as the ιch, of width not less than 4 inches. The driving-pulley of the ıamometer to be 31 inches, working at the rate of 32½ revolutions · minute. For working by steam or horse-power, machines were be worked by a pulley not less than 5½ inches wide, having a ;umferential velocity of 900 feet per minute. The following are ·ulated results of the trials of the various machines now under ısideration :—

STRAW-CUTTERS WORKED BY HAND.

Time of Working, 5 Minutes.

Name and Address.	No. of Revolutions.	Weight Cut.
Turner, Ipswich	20,500	22½ lb.
Richmond & Chandler, Salford	18,500	24½ „
Smith & Ashby, Stamford	19,800	20¾ „
Ransome & Sims, Ipswich	16,965	25½ „
G. Page & Co., Bedford	18,575	24½ „
Mellard, Rugely	18,420	15 „
Hill & Smith, Brierley	20,410	23½ „
Barrett, Exall, & Andrewes, Reading	16,100	19½ „

CHAFF-CUTTER, DRIVEN BY STEAM POWER.

Time of Working, 3 Minutes.

Name and Address.	No. of Revolutions.	Weight Cut.
Smith & Ashby, Stamford	181,050	107¾ lb.
Alcock, Radcliffe-on-Trent	105,140	68¾ „
Barrett, Exall, & Co.	137,000	99¼ „
H. Carson, Warminster	143,260	114¾ „
Walker, Maryport	75,050	28 „
Cornes, Nantwich	136,650	127¾ „
Bentall, Heybridge	162,430	63½ „
Ransome & Sims	72,066	1 cwt. 1 qr. 12 lb.
Garrett & Sons	132,786	1 „ 1 „ 20 „
Richmond & Chandler	79,733	1 „ 2 „ 5¾ „

TURNIP-CUTTERS.

Time of Trying, 3 Minutes.

Name and Address.	No. of Revolutions.	Weight Cut.
Ransome & Sims' small cutter	23,500	93½ lb.
„ „ large slicer	16,030	145½ „
John Warren & Sons, London	25,400	167¾ „
B. Samuelson's large cutter	9,220	116 „
„ small „	5,790	37¾ „
Hugh Carson	14,700	138¾ „
Barnard & Bishop, Norwich	11,520	142¾ „
Picksley & Sims, Leigh, near Manchester	9,300	97¼ „

ROOT-PULPERS.

Ransome & Sims	22,195	79 lb.
B. Samuelson	11,470	36¼ „
W. Goulding, Co. Leicester	30,420	100 „
E. H. Bentall	23,100	72 „
B. Samuelson	30,150	62 „
S. Woods, Stowmarket	24,000	52½ „
Barnard & Bishop	31,945	89 „
A. & S. Fry, Bristol	38,400	80¾ „

OIL-CAKE CRUSHERS.

Name.	No. of Revolutions.	Time. Minutes.	Weight.
Ransome & Sims	98,600	3	118 lb. coarse, 40½ „ fine
„ „	20,820	1	72 „
Barrett, Exall, & Co.	72,800	3	154½ „
„ „	16,975	1	59½ „
W. L. Fisher, Warpston	114,730	3	147¾ „
„ „	52,680	2	153 „
„ „	18,140	1	68 „
W. N. Nicholson, Newark-upon-Trent	33,300	3	129 „
„ „	16,720	2	93 „
„ „	6,320	1	88½ „
E. H. Bentall	124,350	3	164¾ „
„	49,110	2	165½ „
„	27,190	1	124½ „

LINSEED MILLS.

20 lb. supplied to each Mill tested—expected to produce quality equal to sample

Name.	Time taken in Crushing. Seconds.	No. of Revolutions.
W. P. Stanley, Peterborough	70	72,650
B. Samuelson	67	78,090
E. R. Turner	90	72,400
Ransome & Sims	74	59,760
S. Woods & Son	65	80,500

OAT-CRUSHERS.

Name.	Time taken in Crushing. Min.	Sec.	No. of Revolutions.
W. P. Stanley	1	55	98,700
B. Samuelson	1	32	86,830
E. R. T. Turner	0	38	64,100
Ransome & Sims	0	38	87,680
S. Woods & Son	0	30	89,570

THE CAUSE OF FINGER-AND-TOE IN TURNIPS.

By R. Russell.

SEASE in the turnip crop is forcing itself more and more on .ttention of agriculturists, for many are the disappointments to h it has led, after all ordinary means have been used to secure daut returns. How often have the most promising appear- ; been blighted by a mysterious gangrene attacking the young s, running its course in a few weeks, and leaving nothing but worthless remnants to testify to the kind of crop that was ! Thanks to our agricultural literature, observation and :ience have brought to light a vast number of facts regard- he circumstances and conditions that seem to cause, as well mitigate and to aggravate, the disease.

is of the utmost importance that all the facts regarding this se should now and then be brought together, in order that its 'e and cause may be discovered, and the best remedies, under arious circumstances, suggested. At first sight, no facts seem contradictory than those which have been made known of 'ears in regard to Finger-and-Toe, or Anbury, showing how im- ct are the theories that have been proposed to account for the ly. In endeavouring to lay our views before the readers of 'ournal, our main wish is that they may be fully understood, ve shall be glad to modify them if a better explanation of any e phenomena is offered. We shall first state some of the ıg facts with which experience has made us acquainted—facts ı, when considered as isolated or ill-described instances, appear 'ery antithesis of each other. Having been led to consider :-and-toe and clover-sickness as so far parallel in their nature, ut discussing the peculiar difference between the two, we thought that it would give greater breadth to our illustra- to point out some of the conditions which have similar effects ·th plants.

AL ANALOGIES BETWEEN THE CONDITIONS THAT FAVOUR THE HEALTHY AND THE DISEASED GROWTH OF TURNIPS AND CLOVER.

In the first place, it will be generally admitted that soils, of ɜver texture, which are noted for growing good crops of red r, are little liable to produce finger-and-toe.

Soils which have a brown colour imparted to them by the s of iron, are bad clover soils, and also liable to produce :-and-toe. These descriptions of soil are termed "deaf" soils me localities; and it was a just remark of Mr Cooper's of on, in referring to his own neighbourhood, that finger-and- chiefly confined to "deafish soils." *

* *Transactions of Highland and Agricultural Society.*

c. On the other hand, white-coloured, or even yellow-coloured sands, when containing little vegetable matter, frequently produce good crops of clover, and generally sound crops of turnips.

d. Soils having a great redundancy of vegetable matter are not good clover soils, and frequently produce diseased crops of turnips.

e. Calcareous soils, such as in the chalk and limestone formations of England, are much better adapted for the growth of clover than any soils on this side of the Border. It is well known that these soils are comparatively free from finger-and-toe, and that chalk and lime are preventives for the disease on all soils.

f. On many kinds of soils the frequent repetition of clover and turnips renders both crops liable to failure, and hence the recommendation to lengthen the rotation for these crops.

g. The last-mentioned fact so far favours the theory of Decandolle, that plants excrete poisonous substances from their roots, which are inimical to their own species. This is negatived by the fact of clover "sickening," and turnips becoming affected with finger-and-toe, where the crops are grown for the first time.

h. Decandolle's theory is also so far negatived by the fact that the American farmers grow healthy crops of red clover on the same land every alternate year. Also Mr Lawes, of Rothamsted, grows turnips for ten years in succession on the same ground.

i. The same kind of manures that favour the healthy growth of turnips favour that of clover, and thus certain manures so far act as preventives of sickness or dying out.

For example, many instances in the experience of farmers coul be adduced to bear out the views of Mr M'Turk, of Hastings Hall that clover-sickness arises from an actual deficiency of plant-foo within the soil.* This acute writer mentions a field where th crop of clover was a complete failure with the exception of one sid of it on which the sheep had flocked for shelter in winter while co suming the turnip crop. Farmyard manure is also well known t be advantageous to the growth of clover. A writer in this Journal relates that the red clover only flourished on those parts of a fiel where the unspread heaps of manure had lain all the winter pr vious to the sowing of the grass seeds. On the "deaf" sands Kilwhiss I have frequently found that clover only held where th roots came in contact with the farm-manure applied to the pr ceding crop of turnips. If a plant is obtained, clover rarely fai on spots where large dung-heaps have formerly lain. Farmya manure has precisely similar effects in mitigating the ravages finger-and-toe. Mr Lindsay Carnegie's experience is amply bor out, by my own and others, that a liberal dressing of farmya manure will often carry *through a field of turnips to a heavy cr*

* *Transactions of Highland Society*, July Number, 1846.
† *Ibid.*, January Number, 1856.

*which would be almost useless if dressed with farmyard manure alone.**

j. On the other hand, with respect to finger-and-toe, a complete negative instance is sometimes observed in the disease appearing on those spots of a field from which large dung-heaps had been recently removed.

k. Berkeley, Buckman, Curtis, M'Turk, and others, concur in regarding insects either as the primary or secondary cause of finger-and-toe in turnips. The clover plants also seem often to die out by the attack of insects. This has been observed long ago in Norfolk, and Mr Lawes † mentions the circumstance as occurring at Rothamsted. We have seen several instances in which the dying-out of the red-clover plants was connected with the attacks of insects.

l. There is one condition of soil, however, which apparently is entirely opposite in its effects on the growth of clover and of turnips. It has often been observed; and a theory of clover-sickness was founded on the circumstance of clover succeeding best on the headlands of fields that have been carted upon, or treaded with horses' feet. The same mechanical action on the soil is well known to be highly injurious to the healthy growth of turnips, finger-and-toe being generally worse on the headlands.

With the exception of the last paragraph, a considerable number of facts have been stated above, indicating that there are many points of analogy in the conditions favouring the healthy and the diseased growth of turnips and of clover. Before we attempt to reconcile the apparently conflicting facts which observation has made known, we shall proceed to recall a few of the special facts relating to the conditions that have an influence on the turnip crop alone.

m. Mr Wilson, Edington Mains, has observed finger-and-toe to make its appearance where ditch-clearings had been spread over the land. ‡

n. Some farmers find that finger-and-toe attacks every variety of turnips—so much so, that all appear to be equally liable to the disease.

o. There is a great amount of experience indicating that the swede is much less liable to the disease than the common varieties. We have found swedes, sown in alternate drills with purple-top yellow, produce a fair crop, while the latter died entirely out.

p. Finger-and-toe prevails most on dry and light soils; but we know of several instances in which the disease occurred on some spots of a field that had been flooded shortly after the plants were thinned out.

q. Late-sown turnips are much less liable to the disease, and,

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* *Agricultural Gazette*, 5th January 1856.
† *Advice to the Purchasers of Artificial Manures.*
‡ *Transactions of Highland and Agricultural Society.*

in consequence, we have heard some farmers maintain that early sowing was the cause of the disease.

THEORIES OF FINGER-AND-TOE OR ANBURY.

It is singular enough that, while the theory of Decandolle has now few supporters, it nevertheless explains certain facts connected with finger-and-toe better than any other. For example, on many soils, as stated in paragraph *f*, the too frequent repetition of turnips causes them to fail. To lengthen the rotation for this crop is advised in most works on practical agriculture, although no rationale can be given for the recommendation. No one can deny that Decandolle's theory of the soil becoming poisoned by the exudation of substances from the roots of plants, affords a plausible explanation of the necessity of changing some kinds of crops. In fact, as Mr Towers * has said, this theory has been too hastily abandoned; at least it may be said that no substitute has been proposed. Physiologists have lately been inclined to deny that plants excrete matter from their roots, and no doubt the subject is involved in considerable obscurity. It is not necessary, however, to suppose that excrements are the cause of the soil sometimes becoming poisoned or unfitted for the growth of some kinds of plants, but rather that it is owing to the immense mass of roots which are left in the soil. Their remains, we believe, interfere with the healthy functions of the roots, in a manner which we will afterwards explain, and is one of the causes that give rise to turnip as well as to clover sickness.

The original notion of Decandolle, that rotations are necessary for some plants, because the soil becomes impregnated by their excrements—which, while they are poisonous to their own species, are food for other families of plants—is altogether incapable of explaining the facts regarding finger-and-toe. This disease, as is well known, occurs on land where crops of turnips are grown for the first time. The treading as well as flooding of the land, the clearings of ditches, and in some cases the want of farmyard manure, giving rise to finger-and-toe—are all facts quite inexplicable on the theory of Decandolle.

In passing, our readers may be curious enough to learn that this theory which bears the name of Decandolle, seems to have been held by others long before the time of that eminent physiologist. We find Lord Bacon, in his "Novum Organum," insisting upon a similiar doctrine. "If any one were to say," he remarks, "that there is a harmony and friendship between the corn and the corn-flower, or the wild poppy, because the latter seldom grows anywhere but in cultivated soils, he ought rather to say, there is an enmity between them, for the poppy and the corn-flower are pro-

* *Quarterly Journal*, October 1854.

uced and created by those juices which the corn has left and rejected;) that the sowing of corn prepares the land for their production."

Most writers on this subject consider that the peculiar form which ıbury assumes is occasioned by the attacks of insects. The par-cular insect, said to be the *Anthomya brassicæ*, deposits its eggs ı the rootlets, and thus causes swellings in a somewhat similar anner to that by which insects give rise to galls on the leaves of ıe oak. In anbury or finger-and-toe, the depositing of the eggs ıuses first a swelling, which runs on to a putrifying mass, and ulti-ately becomes the nidus for the larvæ of the common fly, for in ıe last stages maggots appear. It is very probable, as Dr Ander-ın has observed, that the different appearances which the disease ısumes are merely different stages of the same disease. In rich nd, for example, its course is much more rapid than in poor; so uch so, that what Mr Goodiff calls the "gouty," or more anbury rm, is rarely seen in the former class of soils.

According to the views of Professor Buckman and others, the sease is supposed to arise from certain classes of soils being fested by the finger-and-toe insect. It has in consequence been ıggested that, with a view to destroy the insects, we ought to learn ıeir habits, and understand why they prefer those soils that are ıble to produce finger-and-toe. On the other hand, Mr Curtis and :hers consider that the particular insects infest all soils, but they ıly deposit their eggs in those roots the juices of which are not in healthy state. Concurring in this latter view of the matter, we fer a few objections to the idea that the disease is caused by in-ːcts infesting only those soilswhich are liable to it.

We believe that the insect-infesting theory had its origin in the ct that caustic lime, when added in sufficient quantity, is a specific ır the disease. It was thought that the lime acted by destroying ıe insects. It ought to be remembered, however, that chalk and arl, which are neutral substances, and not possessed of caustic pro-ərties, are equally efficacious with hot lime in preventing the disease.

Indeed, as great an array of facts can be urged against this ıeory as against Decandolle's. For example, it would compel us ı suppose that the trampling or flooding of the land had the effect ' breeding or attracting the insects; and so also in the case of ıe clearings of the ditches mentioned by Mr Wilson. From these ıstances we would be led into many strange hypotheses in regard ı the habits of the insects, in accounting for their prevalence. Vhen we consider, too, the manures that mitigate the disease, the lea of its being caused just where the particular insects abound, ould give rise to some curious suppositions. We would require ı believe that superphosphate of lime and guano attracted or pro-ıced the insects, while rich farmyard manure destroyed or repelled ıem; that the insects sometimes fled from the swedes on one part ' a field, and destroyed the common sorts on another.

THEORY OF SPECIAL ABSORPTION.

Almost every agricultural chemist teaches that the universal food of plants is carbonic acid, water, ammonia, and the earthy substances found in their ashes; in short, that the food of plants is inorganic. We do not see that there are any objections to the statement that turnips would grow healthily on all ordinary classes of soils, were they to obtain an adequate supply of the earthy and gaseous matters that form their proper food. After a good deal of observation and study, we have been led to the conclusion that finger-and-toe in turnips is owing to the plants being unable to take up a sufficient supply of the earthy and alkaline bases. In consequence of this inability on the part of plants of taking up a full supply of earthy matters, the juices of the plants, being in a corrupt state, are in a condition to become the nidus for insects which attack the plants, and give the disease its peculiar forms.

It is a most important circumstance to bear in mind, however, that although the disease does sometimes arise from an absolute want of the alkaline and earthy matters in the soil, yet it commonly arises from an inability on the part of the plant of taking up the food that is abundantly diffused throughout the soil.

In the article "Agriculture," of *Chambers' Information for the People*, published in May 1857, we gave a mere outline of our views on these questions, as follows:—

"Vegetable physiologists who suppose that plants absorb their food mechanically along with water, are evidently at fault. The process is apparently a chemical one similar to that which takes place when leaves absorb carbonic acid and ammonia from the atmosphere. But, more than this, we have long been led to the conclusion, before being aware of Gazzeri's experiments, that roots virtually exercise, by their contact with solid matter, an incontestable action in imparting solubility to it. The recent experiments of Professor Way, when rightly considered, seem to render this view more probable. They indicate that the rains have little power to wash out of the soil certain constituents that form the food of plants; unless the roots, therefore, had the power of imparting solubility, these substances could not find their way into the structure of plants in sufficient quantity for promoting rapid growth.

"In order that the roots of plants may exercise on the substances constituting their food an absorbent action, which is equivalent to a power of selection, they must be placed in a medium capable of maintaining their healthy functions. That special conditions are necessary to the growth of some plants, is patent to all in the case of the particular kinds which grow in fresh and in stagnant water, in soils abounding in acids, and in others abounding in alkaline earths.

"This peculiar chemical condition of soils, which is a quality over and above the mere presence of the constituents of plants, is a highly important one. Finger-and-toe in turnips, clover-sickness, the dying-out of certain grasses in particular soils, and many phenomena in the vegetable world, arrange themselves for elucidation under this head."

In this extract the doctrine is prominently brought forward that the roots of plants virtually exercise special absorption, not only on those substances *that are soluble*, *but on those that are insoluble*. In Jan. 1858, Dr Daubeny, in a communication from Baron Liebig, also brought forward the doctrine of plants rendering solids soluble before a meeting of the Chemical Society of London.* Up to this period, entirely opposite views were held on this question by chemists and physiologists; but since then a considerable number of men of eminence have given their consent to the doctrine, including Daubeny, Henfrey, Anderson, and the lamented Gregory.

We are all aware that our senses of taste and smell are of a very delicate nature. In many cases they far exceed in delicacy the tests of the chemist. We do not resort to the chemist to tell us by analysis what are the constituents which form good wines, but judge of their flavour and aroma by our palates. Mr M'Lagan, in a paper on the feeding of cattle,† alludes to the effects of different substances in giving flavour to the meat both of wild and tame animals. But there are some insects which seem to be gifted with as nice a sense of taste as the most fastidious epicure.

In some tropical countries, man is subject to the attacks of insects, which illustrate their discriminating power. Their effect has a distant resemblance to the disease we are considering in turnips, for it is really a toe—though not a finger—disease to which the human species is liable. Humboldt tells us that the whites born in the torrid zone of South America may walk barefoot with impunity in the same apartment where a European recently landed is exposed to the attacks of the nigua (*Pulex penetrans*).‡ This animal, almost invisible to the naked eye, gets under the toe-nails, and there acquires the size of a small pea by the quick increase of its eggs, which are placed in a bag under the belly of the insect. The nigua, therefore, distinguishes—what the chemist could not do—the cellular membrane and blood of a European from those of a Creole.

Within the range of agricultural experience there are many facts that might be adduced to show how insects attack plants and animals when they become in any way unhealthy. Sturdy or giddiness in sheep, like finger-and-toe, is caused by an animal; but its attacks seem in a great measure to be limited to flocks whose constitution is enfeebled by exposure to the elements, or whatever impairs the general health.

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* "CHEMICAL SOCIETY, 21st Jan.—Dr Lyon Playfair in the chair.—Dr Daubeny read a communication he had received from Baron Liebig, relating to the absorbent powers of soils. Baron Liebig maintained that the spongioles of plants, in obtaining their supply of saline matter, did not act by simple absorption, but exerted a real decomposing action upon certain ill-defined compounds which the saline matter formed with the insoluble constituents of the soil."—*Athenæum*, 13th Feb. 1858.

† *Quarterly Journal of Agriculture*, July 1854.

‡ *Personal Narrative*, vol. ii., chap. 5.

In the same manner, insects are found in the lungs of sheep affected by rot. Their presence must not be regarded as the cause, but only as a symptom of a weakened constitution arising from bad food. This disease, as Mr Blacklock pointed out before Liebig propounded his mineral or inorganic theory of vegetable nutrition, is caused by the herbage upon which the sheep feed being deficient in earthy matters.*

What is it, we would ask, but a deficiency of earthy and alkaline matters in "deaf" soils that renders the herbage so inferior in feeding qualities? The fact, too, of finger-and-toe being most common on land of this description, favours the views we have adopted—that the insects only attack the roots, and cause the disease in cases where the constitution of the plant is weakened by the want of a full supply of earthy matter. The inability of the roots of turnips, under certain conditions, to take up a full supply of earthy matter on rich lands, produces the disease—as we shall afterwards attempt to demonstrate—when the substances wanted are abundantly diffused throughout the mass of the soil.

In further illustration of insects attacking plants that become unhealthy, we have only to mention how caterpillars attack the swede crop when it suffers from drought. Oats also on light soils become infested by insects in dry seasons. In both the oats and swedes the attacks are often confined to the dry knolls in a field, a better supply of moisture in the hollows preventing the attacks.

Those, therefore, who maintain that the attack of the insect in finger-and-toe is merely a symptom of an unhealthy state of the juices of the plant, have many analogous facts in nature to appeal to. We have already shown that it cannot arise, as Decandolle supposed, in all cases from the soil being poisoned by the excrements of plants. Let us now proceed to show that there is the greatest probability for believing that in all cases finger-and-toe arises from a deficiency of alkalies and alkaline earths within the plant itself. It must constantly be borne in mind, however, that those substances are often abundantly diffused through the soil, but cannot be taken up by the roots of plants.

The mode by which the roots of plants exercise this solvent action on the insoluble earthy matters, has been touched upon by few of those who have given their assent to the doctrine. It is only that the researches of Way and others, on the absorptive powers of soils, have rendered the old doctrine of plants merely taking up what substances were in solution, altogether untenable. We will not scruple to state our own views on this question, for the sake of eliciting discussion, as we have long thought the subject involves the theory of turnip and clover sickness, as well as the local distribution of many kinds of plants.

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* Blacklock's *Treatise on Sheep*.

In the mean time, however, we may show how the theory of special absorption applies in explaining many of the facts of finger-and-toe.

It is now admitted by many men of science, that plants do exercise special absorption on soluble and insoluble substances. This, it is no great assumption to suppose, can only take place if the roots of plants are in a healthy condition. Our explanation of finger-and-toe is, that the fields on which this disease prevails do not afford a healthy medium for the plants to run through in search of food. Under these circumstances, the plants are unable to take up certain earths which are necessary to their healthy growth. The juices of the turnips are, in consequence, in a corrupt or unhealthy state, and thus are liable to the attacks of the finger-and-toe insects, which appear to be common to all soils. The attacks of the insects must, therefore, be regarded as mere secondary—the want of a due supply of alkaline and earthy matters being the real cause of the disease of anbury or finger-and-toe.

Those who maintain that the disease of finger-and-toe arises from a mere deficiency of plant-food within the soil, have what appears to us an insurmountable objection to contend against in the fact of the disease appearing in the market garden-grounds, which are abundantly manured. If cabbages or turnips are repeated too frequently, even on these over-manured soils, the disease of finger-and-toe appears. The means which the market-gardeners use to produce healthy crops of turnips and cabbages, furnishes a cue to the nature of the disease, as well as some of the remedies that should be adopted by farmers as preventives.

Road-scrapings and wood-ashes are found to produce healthy crops, when the most powerful manures fail. Were these substances thoroughly mixed or diffused through the soil, they would not effect a cure, for the roots could not get hold of them. The mixture is put in in handfuls, over which the seed is sprinkled, so that the young plants obtain at once a full supply of earthy and alkaline matters. By this means they are maintained in perfect health, and are free from the attacks of the insects, which give rise to clubbing, or the anbury form of the disease.

Turnips often entirely fail from the attacks of finger-and-toe when dressed with guano and superphosphate alone, but produce moderate crops when dressed with farmyard manure in addition. These facts are in accordance with the supposition that the want of a due supply of minerals is the cause of the disease, for the farmyard manure contains them. It is right to observe, too, that the farmyard manure, like the composts used by the market-gardeners, not being distributed through the soil, enables the roots to reach the mineral matters more easily, without being exposed to the unhealthy state of the general mass of the soil. On this account, the nearer farmyard manure is to the surface, the more likely are

the plants to get hold of it and ward off the disease. Turnips, too, are sometimes affected with the malady on spots from which manure-heaps have recently been removed. The elements of vegetable nutrition are no doubt abundantly diffusive through the soil; but this abundance of organic matters seems to be as inimical to the healthy absorption of the alkalies and alkaline earths as sometimes is the case in market garden-grounds.

Mangold-wurzel grows healthily on the market garden-grounds, and on our fields, where turnips fail from finger-and-toe. Chemical analyses show that the composition of the two plants is in a great measure identical. There are no grounds for supposing that their food can be different, and, besides, mangold-wurzel requires a more liberal supply. This fact, viewed in connection with the means which the market-gardeners use to prevent the disease in turnips and cabbages, indicates that the mangold has the power of abstracting alkalies and earths from the soil, when the turnip has not.

The principle of plants having, under certain circumstances, greater powers of taking up the substances fitted for their healthy growth, affords a consistent explanation of some varieties of turnips being less liable to the disease than others. Swedes seem merely to have greater powers of abstracting food from the soil; for, like mangold, they actually require a more liberal supply than the commoner varieties. A greater power of abstraction in the swede is so far indicated to the eye in the larger number of roots which it sends out from the bulb. This is further indicated in swedes exhausting the soil more than the common turnips. The more liberal manuring that the swede demands, its more abundant produce, and its greater immunity from finger-and-toe, led one of the largest turnip-growers in Scotland, as well as most successful farmers, to put to us the following curious question—rather a bold one certainly, but we must confess that a good deal might be said in favour of those who are inclined to answer it in the affirmative —"Do you not think that it is so far an advantage that there is such a thing as finger-and-toe, as it forces farmers to treat the land better, and to grow swedes, which are so greatly superior to the common sorts of turnips?"

We have sometimes heard farmers maintain that early sowing was the cause of finger-and-toe, in consequence of late-sown turnips being less liable to the disease. This can be readily explained when we consider that early-sown turnips are possessed of less vigour when the season is not so propitious, and accordingly their powers of abstraction are diminished. The flooding of the land and the trampling by horses, we need only observe, can easily be imagined as very efficient causes of interfering with the healthy functions of the roots—of diminishing their powers of absorption —of rendering the plants unhealthy, and liable to the attacks of

insects. Indeed, in these and other cases where the land is not of the soundest character for the growth of turnips, dry and unpropitious seasons, battering rains, and whatever modes of treatment interfere with the obtaining and maintaining a well-pulverised mould, all become apparent causes of the disease.

The circumstance of calcareous soils being generally free from finger-and-toe, and also that lime forms a cure for the disease, is explained by assuming that the calcareous matter exercises a specific action on the decomposition of the vegetable matter within the soil. The compounds arising from the decomposition of vegetable matter are changed by the action of lime, and in this manner the soil becomes a healthy medium through which the roots of plants can extend and exercise a special absorption of the soluble and insoluble substances that constitute their food.

This much all are agreed upon, that the lime does not act in supplying the turnip with a mere ingredient that constitutes a part of its organic structure. A large dose of lime does not act, like an application of wood-ashes, when applied merely when the crop is sown, inasmuch as it requires a certain length of time to produce a certain effect upon the soil. That the beneficial effect of the lime arises from its influence on the vegetable matter, is rendered highly probable, from many considerations.

It has been found that the richer in vegetable matter land is that is liable to produce finger-and-toe, the greater the quantity of lime that is necessary to effect a cure. One-half the quantity of lime that is required to produce the desired result in the neighbourhood of towns, will be amply sufficient for soils of similar texture in the outfields of country farms. Three tons of lime applied to a hungry sand, will have as great an effect in preventing the disease as six tons on a peaty soil.

Though both turnips and clover thrive well on calcareous soils, yet they thrive on some kinds where there are mere traces of lime. In the latter instances the soil is invariably deficient in vegetable matter. Thus we often find clover thriving in the subsoil of the boulder clay of our railway cuttings, where there is little lime or vegetable matter. Turnips, on the other hand, grow entirely free from finger-and-toe on the "sharp" sand forming the subsoil of the northern drift, while in the "deaf" surface-mould abounding in vegetable matter the disease is very common. Clover also thrives in the former description of soil, and dies out in the latter.

The manner in which calcareous matter acts as a preventive of finger-and-toe, appears to be in the influence that it exerts over the decomposing vegetable matters within the soil. It causes the products of decay to be different, and suited to maintaining the healthy functions of the roots. When turnips are repeated year after year on soils abounding in vegetable and deficient in calcareous matter, the immense mass of roots which are left, rather

than excrementitious matter, seem to innoculate soils, so as to impart those conditions that are inconsistent with plants exercising the powers of special absorption.

Indeed, chemists have long taught that it is necessary to admit a principle exactly parallel to the one for which we are now contending, to explain the preference that certain plants give to particular descriptions of soil. The rice-plant, for example, can flourish both in running and stagnant water as well as ordinary soils. The products of decomposition that arise in stagnant water, or in ill-drained soils, are not inimical to the rice-plant, but they are so to other cultivated plants. The most of the American plants that have been cultivated by our horticulturists die out if the soil contains much calcareous matter. The common spurry or yarr (*Spergula vulgaris*) is rarely or never seen in calcareous soils. This weed, however, is the pest in all our sandy soils that are noted for finger-and-toe. A good dose of lime makes yarr disappear from such soils, and they then become capable of growing healthy crops of turnips. Lucerne only grows on soils that contain a very large per-centage of lime, although that substance is not found to be a prominent constituent in its ashes. We have no soils calcareous enough to grow lucerne in Scotland. Holding, then, that the food of rice, the American plants, spurry, turnips, and lucerne, consist of the same substances—carbonic acid, water, ammonia, earthy and alkaline matters—we can see our way to no other explanation of the phenomena of their healthy and unhealthy growth, than that the peculiar form which the vegetable matter assumes under the different conditions of soil, has a specific influence on the action of their roots.

FUNCTIONS OF THE ROOTS OF PLANTS.

The action of the roots of plants, whereby they take up the insoluble substances of the soil, is one that now forces itself on the attention of vegetable physiologists. Just before Liebig's views as to the absorption of insoluble substances by plants were announced, a most interesting article appeared on the functions of the roots of plants, in a leader in the *Gardeners' Chronicle*, 9th January 1858. The writer remarks: "If there is any one subject which more nearly concerns the practical cultivator as well as the man of science, it is the precise nature of the ACTION OF ROOTS; for on them, more than any other organ of a plant, depends the health of crops of every kind, without one single exception. *That the subject should not have been already more skilfully worked up, is one of the curiosities of science.*" There are so many deeply interesting points touched upon in this article, that it would afford abundant material for a separate paper; but we will only refer to a few of them in the course of our remarks, which must now be necessarily limited.

Physiologists are all agreed that the roots of plants extend through the soil by the addition of new matter to their points. "A root," as Lindley well observes, "is extended much in the same way as an icicle, by the constant superposition of layer over layer to its youngest extremity; with this difference, however, that an icicle is augmented by the addition of matter from without, while the root lengthens by the perpetual creation of new matter from within." It is the points or *spongelets* of roots that chiefly absorb the food of plants. The whole surface, also, of *young* roots is supposed to be absorbent until the bark becomes too thick, as it is in the large roots.

The new substance that is added to the roots of plants consists of cells, which are constantly forming at the points, and thus come in contact with fresh nutriment. The cells consist of thin membranes, called the walls, containing fluids, termed the cell-contents. It is out of the contents of the cell that the walls gradually thicken, and in this manner more solid wood is formed.

It ought to be kept in mind, that the younger the cells, the thinner the walls that separate the vital contents from the earths and alkaline substances of the soil. Through those substances that form the food of plants, the fresh-formed rootlet is constantly pressing and forcing for itself a passage.

The walls of the youngest cells, it must be admitted, are an exceedingly thin membrane, separating the cell-contents from the inorganic substances that constitute the food of plants. This partition, indeed, I conceive, is so delicate, that the cell-contents are attracted by and act upon those earths which are essential to nutrition. The existence of a chemical affinity between the cell-contents and the earthy substances in the soil is thus, in all probability, the force which acts in assisting to liquefy solids. In this manner the earthy substances constituting the food of plants, which chemists have amply proved to be in a great measure insoluble in water, are taken up by the roots of plants.

As we have formerly said, there must exist within the plant a chemical affinity betwixt the cell-contents and the inorganic substances, whether of the gases in the atmosphere or the earths in the soil, which are universally admitted to be the food of plants, else there could be no assimilation. Thus the gases of the atmosphere are solidified by the affinity subsisting during the day betwixt carbonic acid and some vegetable principle in the cells of the leaves. The attraction which the leaf exercises on the carbonic acid of the atmosphere, is assumed to be identical in its nature to the attraction which the roots exert upon their insoluble food in the soil. The absorption of food at the opposite extremities of plants is regulated by the same principle—that of CHEMICAL AFFINITY.

Not a little confusion appears to us to arise from the terms that have been applied in order to distinguish betwixt this chemical

action of the roots and that of the leaves. We say that the leaves absorb the carbonic acid of the atmosphere, and that the roots "select" the earths forming the food of plants. Our ideas are so clear in regard to what takes place in the case of the leaves, that the expression of "leaves selecting the carbonic acid from the other gases of the atmosphere," would sound rather strangely. The term "selecting power," applied to the roots, must be regarded as a mere chemical affinity subsisting between the newly-formed cells or cell-contents and those insoluble earths which constitute the food of plants.

The cell-walls of the spongelets of the roots of plants being so thin and delicate, we believe that they form no greater barrier to the cell-contents acting upon the earthy matters against which they are pressed as the roots run through the soil, than the cell-walls of the leaves do to the carbonic acid of the atmosphere. On this supposition alone can we account for the great increase of roots that takes place when the food is more abundantly distributed in certain parts of the soil.

We find, for example, that pieces of bones become entirely covered by a matting of turnip roots. It is difficult to conceive how this can take place, unless by the affinity that subsists between the spongioles and the matters of the bones. The cell or cell-contents of the rootlets are constantly attracted by the fresh surface of a substance for which they have a chemical affinity. This causes the roots to entwine themselves around the piece of bone, indeed, in some measure, like the icicle, actually deriving its substance from without. The roots of plants thus form a ball of roots round a piece of bone, not rolled, however, as we would, from without, but from within, by the new cells being constantly formed in contact with a substance for which they have a chemical attraction.

The writer of the article in the *Gardeners' Chronicle*, to which we have above alluded, gives an account of some experiments by Gasparrini, on the noxious effects of vegetable matter, in its first stages of decomposition, on the roots of plants, in consequence of the formation of moulds. In a pot of well-washed Vesuvian sand, some seeds of spelt were sown, and produced plants, that continued to grow in a healthy state. In another pot of the same substance that had a piece of bread introduced, the roots did not penetrate the bread, but turned back towards the sides of the pot, and some roots became diseased through the mould that the bread produced.

This is perhaps a parallel of what takes place under those conditions of soil that give rise to finger-and-toe. Spelt would not grow in a healthy state if the soil was largely mixed with bread. Or, if the decaying roots which a crop of spelt left in the soil had an effect on its roots precisely similar to decaying bread, we can readily understand how the growth of one plant should be prejudical to its own or another species. It seems to us a chemical necessity to

admit some such effect of the decomposing vegetable matter of the soil. Indeed, we often find in anbury soils the roots of the swedes making continual efforts to put forth new roots when the others have rotted away.

But, on the other hand, the existence of the vegetable matter within the soil probably acts most energetically in preventing the special absorption of those substances which are the food of plants. The cause of subsoils containing little vegetable matter, growing healthier turnips and clover, in all probability arises from there being no crude vegetable matter to interfere with the special absorptive powers of the roots. The surfaces of the alkalies and earths come readily into contact with the naked cells, which thus more easily dissolve those insoluble substances. Hence healthy plants of clover and turnips are often maintained in poor soils.

The infertility that practical men associate with the dark-brown colour of those soils which are termed "deaf," arises, we have long thought, not from any poisonous effect of the oxide of iron, which imparts the peculiar colour, but from its locking up the food of the plants. The particles of soil are coated over, or painted by the oxide of iron, which affords a bad surface for the roots of plants to act upon and exercise their solvent powers. As an effect of this deficient supply of earthy matter, grasses, and all crops that grow on such soils, are awanting in nutritive qualities, and turnips are particularly liable to the attacks of finger-and-toe.

We can readily believe that bone-dust which has been coated over by roots of turnips, would not be so well adapted for nourishing another crop of turnips, for the coat of old roots would be so far repulsive to the young roots. Like the bread to the spelt roots, it might cause disease, by interfering with their healthy functions.

The action of lime, then, in preventing finger-and-toe, arises from its influence on the vegetable matter within the soil. It directs the nature and character of the products of decay, and brings the soils into a state fit for the healthy action of the roots, whereby they are enabled to absorb a proper amount of those earthy materials which constitute their food.

In concluding, we shall only slightly touch upon the facts mentioned in paragraph *l*, where the conditions favouring the healthy growth of clover and turnips are apparently entirely opposite. Clover often succeeding best on the headlands of fields, is no evidence that it is the mere physical condition of the land that has favoured the plants. The phenomenon most probably arises from the manure that is dropped in the carting, as well as by the subsoiling that takes place by the cutting of the wheels. Were the same land well pulverised, it would grow better crops of turnips than the adjoining parts; indeed it would grow better crops of any kind. Between the time that the headlands are carted upon and the sowing of the

clover crop, a winter's frost intervenes, and effectually pulveris the cloddy headlands. It is so far a mistake to suppose that a fin state of the soil favours the growth of clover. In many distric of the compact soils resting on the trap-rocks of Scotland, clov does not succeed well after wheat or beans, unless the land obtai more than one ploughing.

The remedies for finger-and-toe or anbury have been so far i dicated in discussing the causes. But to recapitulate. Lime is th most efficacious, and, besides, it destroys many kinds of weeds, th healthy functions of whose roots are quite the opposite to those o the turnip. In those cases, however, in which it is not convenie to lime, the disease may be greatly mitigated by the application o suitable manures. Composts formed by earth, bones, ashes o wood, and small quantities of lime, are well worthy of a trial. I should not be distributed through the soil, but placed in handful as near the surface as possible, and the seed dropped upon it. B this means a young healthy plant would be obtained, and it woul afterwards be enabled to push its roots through the soil. B applying rich farmyard manure, and substituting the swede fo the common sorts of turnips, the disease in many districts has lo half its terrors.

THE PRESENT POSITION OF AGRICULTURE.

By A Farmer.

The last twenty years embrace one of the most eventful perio in the history of British Agriculture. If we consider them in the political aspect, our thoughts revert to those stormy times whi witnessed the death-throes of the Corn-Laws,—to those dark da of transition which ushered in Free Trade, and to the succeedi period, during which many important political events occurred a had a material effect on agriculture. If we take a professio view of them, we mark the rapid progress of agriculture from t infancy of thorough drainage to its full development—in the i mense improvements which have taken place in the preparati of the land for the crops—from the darkness which envelop the principles of agriculture, producing a doubtful empiricis to that clear light of truth which has been shed abroad by labours of Liebig and his fellow-labourers, raising it almost to dignity of a science—from a limited list of manures, and a bl uncertainty in their application, to one bewildering from the nu bers it contains, but with well-defined rules for the use of th

Now, from adverting to the change in the political conditio the farmer, and to the progress in the science and practice of a culture, we are led naturally to inquire into what may strictly

called its commercial state. The great disparity in the prices of farm-produce in different years since the repeal of the Corn-Laws, forces such an inquiry upon us. It is clear that some other causes than Free Trade must have been at work to produce this disparity, as it was generally alleged that the effect of Free Trade was to produce a uniformity in prices. Either therefore this assertion must not be true, or there must be some counteracting agents to disturb that equilibrium in prices which otherwise would have taken place. A short review of the period referred to may not be unprofitable at present, and may aid us in ascertaining the real position of the farmer; for we confess we cannot banish from our thoughts the anxiety that his present situation is not one of the most hopeful.

	Yearly average price of Wheat in England.	Fiars prices of Wheat in Edinburghshire.	Wages of Men hired by the Year in Edinburghshire in addition to meal, potatoes, &c.	Wages of Women hired by the week in Edinburghshire.
	Per Quarter.	Per Quarter.	Per Annum.	Per Week.
1840	£3 6 4	£2 16 8	£16 0 0	£0 5 0
1841	3 4 4	2 13 6	16 0 0	0 5 0
1842	2 17 3	2 5 0	16 0 0	0 5 0
1843	2 10 1	2 11 6	16 0 0	0 5 0
1844	2 11 3	2 3 4	16 0 0	0 5 0
1845	2 10 10	2 4 10	16 0 0	0 5 0
1846	2 14 8	3 4 0	17 0 0	0 6 0
1847	3 9 9	2 11 6	18 0 0	0 6 0
1850	2 0 3	1 16 4	17 0 0	0 5 0
1851	1 18 6	1 17 6	17 0 0	0 5 0
1852	2 0 9	2 6 0	17 0 0	0 5 0
1853	2 13 3	3 2 4	18 0 0	0 5 0
1854	3 12 5	3 8 1	19 0 0	0 6 0
1855	3 14 8	3 10 9	21 0 0	0 6 0
1856	3 9 2	2 0 0	21 0 0	0 6 0
1857	2 16 4	... ...	21 0 0	0 6 0

We have not thought it necessary to state the quantities of meal and potatoes, and the other perquisites which form a part of the hired men's wages, as these always remain constant, and are not money paid directly out of the pocket of the farmer. We have thought it better also to use the wages of the men hired from year to year for comparison here, as they generally regulate the wages of the men engaged from week to week. Our object in bringing forward these figures is to show the reader that, while the average price of wheat in England from 1840 to 1847 was 2s. 5d. per quarter higher than the average price from 1850 to 1857, the average annual wages of the men were L.2, 10s. lower in the former period than in the latter. The wages of the women, it will be remarked from the tables, follow those of the men in some measure. And

we would also observe, that while prices have been falling rapidly since 1855, wages have remained at the high rate to which they attained during the Russian war—a rate higher than was ever known before in agriculture. Nor do these figures tell the whole truth, for harvest wages, which have been much higher for the last few years than they were wont to be, are not at all indicated by them. We are sure that most farmers will agree with us, that if we take into account the wages of the people constantly employed on the farm, harvest wages, and also the rise in tradesmen's accounts, such as smiths, carpenters, &c., the expense of labour on the farm since 1850 will have increased fully 6s. or 7s. per imperial acre, which is just equivalent to a rise of rent to that amount.

Now, there must be some good reason for this difference in wages; for, like everything else, the price of labour, or wages, is just in proportion to the demand and the supply. Either, then, the demand for labourers has been more than unusually brisk, or the supply has been deficient. We believe that both a greater demand and a more deficient supply of labourers, and particularly the latter, may be adduced as sufficient to account for the present high rate of wages. First, then, the demand has been increased by the great improvement in trade; by the requirements of an improved agriculture—there being a great increase of land under tillage and in green crops, which require more hands than all the other crops in the rotation; and by the wars in the Crimea and India. But while the demand was thus increased, the supply was at the same time diminished by the great emigration which has been going on for some years. We will shortly now direct our attention to this point.

The largest number which emigrated in any one year from the United Kingdom for thirty-two years, from 1815 to 1846, was 129,851 in 1846, and the average annual emigration during that period was 52,258. The numbers during the succeeding eleven years were as follows:—

In 1847,	258,270	In 1853,	329,937
1848,	248,089	1854,	323,429
1849,	299,498	1855,	176,807
1850,	280,849	1856,	176,554
1851,	335,966	1857,	212,875
1852,	368,764		

And the average annual emigration during these eleven years has been 273,730, or fully five times more than the average annual emigration of the previous thirty-two years; and the gross number which has emigrated during the eleven years has been 3,011,038; while in the eight years from 1847 to 1854 inclusive, more than one-half of the whole emigration in the forty-three years from 1815 to 1857 inclusive, took place. These figures are very significant, and teach us some curious facts. We find that there has

been an immense increase in the emigration during the last eleven years, commencing with that dismal exodus from Ireland in 1847; and two years had not elapsed from the time our ports were thrown open for the reception of the corn of the whole world, when the yearly average emigration for four years was swelled to 334,524. And this rapid draining of the population of the country was only stopped in 1855 and 1856, in consequence of the great demand for recruits for the army and navy. No sooner, however, did this demand cease with the conclusion of the Russian war, than emigration increased rapidly again in 1857, and was only checked in the latter half of that year and in 1858, by the recruiting for the army at the commencement of and during the Indian mutiny.

It requires no further argument or facts to prove that the inevitable consequence of such an immense emigration, while the demand for men for the army and navy, and for the purposes of trade, manufactures, and agriculture was much increased, must be a rise of wages. And though it is clear that the reduction of the labourers to such an extent, even though those who emigrate may be taken entirely from one class, must tell in a short time upon all classes of the employed, still the great disturbance in the labour market would be felt most at the time in that particular class from which the drain of the population was made. We will, therefore, inquire next from what section of the community the largest number has emigrated.

We find that, if we deduct the number of foreigners who emigrated from this country, from the gross number in 1857, about one-half of the remainder were males above twelve years of age, and one-third were females above twelve; that is, about five-sixths of the emigrants in 1857 were adults, or fit for work; for even, unfortunately, at the early age of twelve, too many children are hired out to herd or do other light work. It is difficult, from the classification given in the report of the Emigration Commissioners, to tell the real number of emigrants belonging to the agricultural class. Fully more than one-half of the male emigrants are classed under two heads which cannot be said to belong to any profession, viz. "general labourers," and "not distinguished." If by "general labourers" are meant those who work generally with pick and shovel, either in town or country, we are entitled to class them with agricultural emigrants, for their place at home would more readily be supplied by labourers from the farm than from any other quarter, and thus a scarcity would be created of agricultural labourers. 34,923 general labourers emigrated in 1857, of which we claim 22,000 for agricultural; and we do this with less hesitation, being aware that the Emigration Commissioners give every encouragement, and even preference, to labourers from the country who have some knowledge of field-work, though they may never have been hired to a farmer, or wished to be styled "agricultural

labourers." About 22,413 are "not distinguished" under any particular head. Of these a considerable number would be boys above twelve years of age, who could not be said to belong to any particular profession; but, for the reasons stated above, we claim 14,000 as belonging to agriculture.

In 1857, then, there emigrated from the United Kingdom—

Of Agricultural labourers, gardeners, &c.,	5,819
Farmers,	9,099
General labourers,	22,000
Not distinguished,	14,000
	50,918

Or about one-half of the whole males who emigrated, after deducting foreigners. Thus, from the above data, we arrive at the number of males, not foreigners, who emigrated during the eleven years from 1847 to 1857, viz. about 1,290,000, one-half of whom, or 645,000, belonged to the agricultural class. We believe these figures to be as near the truth as any approximation can be made from the returns made by the Emigration Commissioners. We need not say that there is more than sufficient reason to account for the great rise in the wages of agricultural labourers, particularly when we mention, in addition, that the number of agricultural adult males who emigrated for the last eleven years from the United Kingdom would be required to labour upwards of 11,000 imperial acres at home. And though, no doubt, their place was in some measure supplied by the young growing up, still it must be borne in mind that, from the improvements in drainage and otherwise, there has been a great increase of land under tillage.

It may be asked, "Is there no way of reducing the present heavy outlay on labour on farms?" This can only be done by reducing the demand or increasing the supply. And we have no hesitation in saying that, if present prices of farm-produce and present rates of wages continue, farmers will be compelled to reduce the demand, by throwing more land in grass, or using more machinery on their farms. Already have the more prudent begun to make arrangements for diminishing the extent under the plough, which will, if extensively carried out, be materially felt ere long. In the use of machinery, within the last ten years much progress has been made. Were it nothing else but the extensive use of the grubber for preparing the land for green crops, the economy of labour in proportion to the extent in green crop has been of immense benefit to the farmer. The employing of reaping-machines also has tended materially to supply the deficiency of hands, which otherwise, at one of the busiest and most critical periods of the year, would have been most disadvantageous to the farmer. We can only again impress upon him the necessity of encouraging the improvement of agricultural implements and

machinery by a liberal use of them. And we are happy to observe that a want, long felt both by farmers and agricultural implement makers, has been lately supplied by the publication of the *Book of Farm Implements and Machines*, under the editorship of Henry Stephens, whose experience and well-known character for accuracy and painstaking attention to details is a sufficient recommendation of the work. To the farmer it is useful as a guide for the selection of the best implements and machines; to the agricultural machinist, as a guide for the construction of them. We see no immediate prospect of wages being reduced by an increase of the supply; for such is the desire for emigration, and the encouragements held out both by the home and colonial governments for proper labourers to settle in the colonies, that the only circumstance which has operated as a check since 1850 has been war, first in the Crimea, and now in India. Aud we have seen, from the emigration tables, that no sooner is this check removed, than the numbers of emigrants swell up to what they were before the war. And this will continue to be the case till some equilibrium has been established between the wages at home and in the colonies. True, every homeward-bound vessel from America brings its freight of returned emigrants at present; but this must be regarded as only partial and temporary, arising from the failure of the crops there, and the consequent want of money. But we know that many who have returned are in correspondence with those they have left behind in America, who are to give information of the least revival of the demand for labourers there in spring.

The greatest enigma at present in agriculture is rent. The most experienced farmer—the most avaricious landlord—the most sanguine improver—is deceived in his calculations in this important element in land transactions. Some accuse the landlords of being too exacting and greedy; and others lay the blame on land-valuators for misleading their employers in the value of land. But the truth is, that both of these parties are at as great a loss to account for the rise of rents as the most ignorant; for when the former advertises a farm, he is sure to get the offer of a higher rent from men likely to prove good tenants than he ever expected; while land-valuators, to keep pace with the offerers for farms, are obliged to put such a value on the subject as may correspond with what it will bring when exposed to public competition, and which is considered its market-value, though they do this often against their own judgment. The fact is, the fault lies with the tenants themselves, or rather with the offerers. No sooner is a farm advertised to be let, than there is a keen competition for it from men who have farmed as tenants all their lives, and from those who have never known the anxieties of the farmer's life. High rents are always offered by the latter, and not unfrequently by the former. What, then, can the landlord do but

select from the list sent in to him a good practical man offering a good rent?

But do we say that there should be no rise of rent for a farm in which a judicious course of farming has been followed for nineteen years? Certainly not; on the contrary, in most instances it would be quite unreasonable not to expect a legitimate rise of rent. And this rise would be expected, on two grounds in particular: First, a farm, for instance, which has been all drained during the previous lease, should bring an additional rent at the commencement of a new lease, equal, at the very least, to the interest of the money laid out in drainage, which we suppose to have been effectually performed. Again, if, besides being drained, the same farm has been brought into a high state of cultivation by a considerable outlay of money by the ocupant, whether landlord or tenant, during the previous lease, it should, if exposed to public competition, bring an additional rent equal to the interest of the money laid out by the occupant. Many cases have occurred of late where a tenant, by imprudently making a large outlay of money on his farm, has been unable to take a new lease of it from the want of capital; and when this farm has been exposed to public competition, the rise of rent has been considerable, sometimes amounting to 20 or 30 per cent on the old rent, which was nothing more than what might have been looked for, being but a fair interest for drainage and improvement money added to the old rent. We believe that much of the rise of rent of late may be accounted for in this way. But we cannot conceal from ourselves the fact that, in very many instances—we would almost say the majority—higher rents have been offered for farms during the last two or three years than their condition and previous management warranted. So keen has been the competition, and so much have people been carried away by the prosperous years during the Russian war, that they are led to offer rents for farms which would have been low enough at that period, but which are now extravagant, when the altered circumstances are taken into account, viz.—lower prices for farm-produce, higher wages, and dearer manures. But how has this great competition arisen? From merchants and others, who, having made money at their business, entering the list of offerers for farms, and carried away by the wild statements of some enthusiasts of what science can do for agriculture, and by their opinion of the stupidity of the present laggards of farmers who cannot perceive the advantages of their situation, have offered more for farms than prudence, guided by experience, would dictate. But we fear much that a day of reckoning is at hand; and we know that the many farmers who were somewhat appalled at the results of the balance of their last year's accounts, will not give us any credit for foresight, which we do not claim, when we predict an approaching crisis in the agricultural interest. As a class, farmers do not require to be told of

this; but we fear that there is woeful ignorance on this subject prevalent among the general public, whom nothing but distress among agriculturists, which unfortunately will be too apparent in a short time, will undeceive. Not a few farmers have already taken the alarm, and, disheartened at their continual want of success in getting farms at the rents offered, have sought a home in foreign lands. In 1857 no fewer than 9000 farmers emigrated from the United Kingdom, the very life-blood of the agricultural body.

Our attention has lately been drawn to the published answers to a list of questions issued by the French government, on the condition of the British farmers since 1850; since, in fact, the repeal of the Corn Laws. We understand that the questions have been issued for obtaining information with the view of bringing under consideration the question of Free Trade. The questions, with the exception of No. 3, "What has been the influence of the repeal of the Corn Laws on agriculture in Britain?" are all of such a character as the most enthusiastic Free-trader and the staunchest Protectionist would have no difficulty in agreeing to return the same answers to them. There is no doubt that the country enjoyed considerable prosperity from 1850 to 1857. The total abolition of the customs duties on upwards of four hundred different articles in 1845, and their partial remission on many others in that year and in 1842, gave an impetus to trade which went on increasing year after year, when it had fairly recovered from the shock which it sustained in the disastrous year of 1847. There is as little doubt that the agriculturists, as a part of the body corporate, shared in that prosperity in some measure, after the transition years of 1850, 1851, 1852, during which it cannot be denied there was much suffering from low prices consequent on the repeal of the Corn Laws, but which was considerably relieved by some causes which we will mention forthwith. Many farmers, foreseeing that the repeal of the Corn Laws was inevitable, had prepared for the worst, and this, with the low price of guano, assisted them to weather that storm which otherwise would have caused their ruin. And we firmly believe that there are few among them who would ever think of joining in any agitation for the re-imposition of the Corn Laws; not so much because they can trace any great benefit to themselves from their repeal, as on account of the bad feeling and hostility which they excited among different classes in the community where they were always a bone of contention. For the same reason, many gave their tardy consent to their repeal, unconvinced by the contradictory arguments of the Free-traders, who told the working-classes that the effect of the repeal was to give them cheap bread, and with the same breath asserted to the farmers that a course of unbroken prosperity was before them, as the demand for their produce was to be so much increased by the briskness of trade as to keep up prices. The repeal of the Corn

Laws should not be looked at in such a narrow and distorted view, but rather in the more expanded and open one, as a part of that system which was commenced by Huskisson and carried out by Peel.

As the subject of these questions of the French government refers to the period of which we are treating, and is, in fact, if not the very subject which is engaging our attention, intimately connected with it, we will enter more fully into it than we would otherwise have done. We said before that Free-traders and Protectionists would return similar answers to all the questions but to No. 3. The former will attribute the prosperity of agriculture, during a part of the period from 1850 to 1857, mainly to Free Trade; the latter will adduce other causes to account principally for it. We ask farmers to exercise their own judgment in this case; let them turn to their books and see what years during that period have been the most prosperous. We allude of course here only to arable farmers. They will find, we think, that the end of 1853 and 1854-55—and in some parts of the kingdom where the harvests were favourable, 1856—were their best years. Now, Free Trade existed during these years; but it existed also during 1850, 1851, 1852; and it exists now: and why is there such a difference in the circumstances of the farmer in these last-mentioned years, and in the former, as indicated by his books? It will be recollected that, during the summer of 1853, negotiations were going on with Russia; that, as the year wore on, the relationships between the negotiating countries became more and more critical, till the climax was reached in the spring of 1854, when war was proclaimed. It raged with fury till the autumn of 1855, when it may be said to have been virtually concluded; but the effects of it in high prices continued for some time after. Surely no one will deny that the principal cause of the prosperity of the farmer during these years was the Russian war. We have had the Indian war since; but it has affected the British farmer in a different way, by keeping up the price of labour without raising the price of produce, because the produce of India does not enter into competition with that of Britain. But though we were at war with one of the best customers of our manufacturing interest, it was unaffected in its prosperity, and trade generally was brisk, arising very much from a new market having sprung up in Australia, and also from the demand created in other countries whose produce was imported duty-free into this country. Our manufactures and commerce then being prosperous, aided in some degree to keep up the prices of farm-produce, raised so high by the war. To this extent, then, the farmers were indebted to Free Trade for a part of that prosperity which visited them in those years of war. Nor should we forget, too, that Australia required food as well as clothing, and much of the grain and other farm-produce of this and other coun-

that would have been consumed here, was shipped to the
podes, causing a rise of prices at home.
uch has been said about the progress of agriculture since 1850,
the stimulus given to it by Free Trade. A great deal of land
been drained and brought into cultivation, farming has been
oved, farmers have become more energetic, larger crops are
vn, rents have been raised, and the income of farmers has been
nented. What an epitome of the results of agricultural pros-
y! But still it is generally true. But was not the improve-
t of land carried on most vigorously ten or fifteen years before
)? No doubt a great deal more was done about and after that
, from proprietors availing themselves largely of the Govern-
t grant of drainage-money proffered to them when the Corn
s were repealed. We admit, that never has as great progress
made in the same length of time as from 1850 to 1857, in
general improvement of agriculture—in its machinery and im-
ent department—in the use and application of manures—and
but not least, in the favour of farmers for science. And we
it that, in consequence, more land has been brought under culti-
n, and larger crops raised. But we should not forget that the
for this progress and improvement was laid ten years pre-
sly. Smith of Deanston had long before directed public attention
e benefits of furrow-drainage, and proprietors and farmers in
y districts had responded to his call by carrying out extensive
age operations, which were greatly increased after the drainage
ey grant, as we said before;—agricultural societies throughout
country had shown more life and earnestness in improving
breeds of cattle and implements, and otherwise furthering
ever tended to the melioration of the soil;—Liebig had
his views on agricultural chemistry before the public, and
ed a world-wide enthusiasm on the subject;—the farmers of
and had shown that they were fully alive to the importance
e application of chemistry to agriculture, by engaging the
ces of the late Professor Johnston, one of the first chemists of
lay, to instruct and assist them in the scientific part of their
ssion;—the Royal Agricultural Society of England had been
lished, having for its motto, "Practice with Science," through
e influence an immense impetus had been given to the agri-
re of England;—guano had been discovered, and was hailed
e farmer as a valuable assistant in increasing the produce of
rm, and was within the reach of all from the comparatively
price at which it was selling. Thus we see that, previous to
, the first steps had been taken for an advancement in agri-
re; that up to 1850 it was in rapid progress, when it received
npetus that has carried it on ever since. The farmers, imme-
ly after the repeal of the Corn Laws, instead of being given
o despair, nerved themselves to overcome those difficulties

which had been brought upon them by the introduction of F Trade;—and we trust that the spirit of inquiry then evoked never be allowed to flag.

We have already accounted for the extravagant offers wh are made at present for farms; we have shown that this has b caused very much by the keen competition among farmers th selves, stimulated by the opposition of merchants and others have made money in trade. We hinted at the probability offerers being misled by the prosperous years during the Rus war, without considering fully the altered circumstances in fa ing at present. There is, we think, another important fact t has been overlooked by them. In the answers to the question the French government, as reported in the *Agricultural Gaz* and other periodicals, it is invariably admitted that there been a considerable augmentation in the produce, arising b from improvements, from drainage, and from the system of hi farming now practised. We are afraid that many, on seeing crops, attribute their luxuriance to the permanent fertility, or farming language, good condition of the soil, forgetting that luxuriance has been caused in most cases by the application light manures, whose effects on the soil are of a temporary cha ter; that the use of these manures necessitates a larger outlay tenant's capital; and that the relative prices of them and of gr are very different now from what they were in 1854.

As it is not our wish that any one should take too gloom view of the present state of agriculture from what we have sta before, we will proceed to mention some circumstances wh should make the position of farmers now as good as it was in so years when prices were as low as they are now. We may well, however, guard our statements by reminding our readers what we have already mentioned regarding those farms that ha been recently let at extravagant rents. We can only express fears again that even the most energetic and skilful managem will scarcely produce a satisfactory balance-sheet to the tena Now, one hope of the farmer is, that though grain is selling l dairy-produce and beef are unusually high. The high price the former may be attributed to three causes: 1. The pleu pneumonia among milch cows; 2. The increased consumption butter and cheese; and, 3. The diminished supply from abroad, b on account of less production, and of large exports to Australi salt butter and cheese. The high price of corn, and its free portation into this country, induced many farmers in the no west of the Continent, from whom we obtained a large supply butter and cheese, to throw more land into corn, and thus cur their pastures through which they obtained mainly their da produce. Again, butcher-meat is now much more extensiv used among all classes, arising from the prosperous conditio

the labourers, who, having good wages, cheap bread, and also cheap beef, immediately after the repeal of the Corn Laws, were enabled to indulge daily in a little flesh. A taste for it being now created, it is difficult for them to dispense with the use of it when they cannot so well afford it, so that the consumption of it has not been reduced by its present high price. It must not be supposed, however, that though beef is selling well, the fattening of cattle is profitable: the price of lean stock is far too high in proportion to fat to leave any great profit to feeders. We also mention that the high price of lean stock is caused in some measure by a scarcity arising from that dire scourge pleuro-pneumonia.

Thus, then, the course of the arable farmer is clear. He must raise less corn, which is not so profitable now, and, throwing more into grass, resort to the dairy or the rearing of stock. By this means, too, he will reduce his labour-account, which is the great difficulty he has to contend with, swallowing up all his profit. A better level will thus be obtained of everything. The foreigner will continue to pour his cheap corn into our market, and dairy-produce and beef will be considerably reduced in price, while wages must also fall, if the colonies are satisfied with their supplies, but not till then. Another circumstance worthy of the consideration of the farmer is, that, though placed at great disadvantage from the high wages, he is enabled to raise his crops at a cheaper rate from improved machinery, improved modes of culture, and, above all, cheaper manures, than he could do twenty years ago. There is no doubt that guano and its allies are the best friends the farmers ever had. And we would certainly be much disappointed in the pluck of the British farmer if, with these advantages (though we admit he has great disadvantages at present to contend with), he should be terrified at Free Trade. Ten years have now nearly elapsed since the free importation of corn, and, with the exception of the transition years (during which even he was much relieved of his difficulties by the opportune discovery of guano), he has been very little the better or worse of Free Trade. Its effects have always been counteracted by other agencies, which have been fortunate coincidences. We believe that the time is only now approaching when the great experiment of Free Trade on British agriculture is to be tried; and we must say that the farmer is now in a better position for enduring such a trial than he was in 1850. As he has of late years fully appreciated the labours of science in his behalf, we trust that he will apply to it for a continuation of that aid, and will give, by his management, an illustration of that motto—"Practice with Science."

measures as there were petty principalities, of which th
kingdoms are made up: the inhabitants of each petty
as wedded to their own weights and measures, as if upon
istence depended their own liberty. The certain effect of
pulsory measure under such circumstances would, we bel
been rebellion and revolution; and the real consequence
missive measure has been, as we see every day around us
minable confusion—a perfect Babel of weights and meas
other circumstances have tended to produce dissatisfactio
those who ventured to legislate on the subject were little
acquainted with it, and did not consult practical men as
they ought to have done; and hence inadvertencies w
which, though slight in themselves, became most serious
being attempted to be carried into practice, they were
every hour and transaction to be grating on the convenie
public. In former times the necessity of legislation on th
was little experienced from the want of communication be
ferent parts of the country, by means of trade and otherwi
the annoyances now felt at such a variety of weights and
were scarcely experienced then; and hence also the
found in substituting the imperial for the local mea
weights; they both became jumbled together, and new
were actually made out of the mixture. Now, however,
try appears to be ripe for legislation again, if we may ju
the meetings which are constantly being held, and from
ations which are being appointed by different mercantil
nities to represent their case to Government. In the sa
more than in anything else, there is g room for imp
n the weights and m es The pr nt method of

;hland Society in March 1857, and which was reported in all agricultural periodicals of the time. We will begin with the .r 1824, in which a great attempt was made by the Legislature " ascertain and establish uniformity of weights and measures," passing an Act. Previous to the passing of this Act, every ınty had its own standards of weight and measure by which grain was sold; and the Act passing into law did little to ıedy this evil, though its avowed object was to produce unifor-;y. We quote from the paper of Mr M'Lagan, read at the eting of the Highland Society referred to above. "There were eral defects in the Act:—1. None but scientific men were ımined by the commissioners previous to the framing of the t. The advice of practical men, or men engaged in trade, uld certainly have been of use in the composing of any measure the uniformity of weights and measures. 2. Two pounds were ained, the troy and the avoirdupois. 3. Heaped measure was also ained. 4. Existing weights and measures were allowed to be d, provided they were marked so as to show the proportion they ·e to the standard weights and measures. The effect of this asure was the introduction into Scotland of new weights and asures which were never contemplated by the Act." The weak nt in this Act was what is noted as the fourth defect above. It vented being done all that the Act contemplated to do. It is use 16th, and enacts "that it shall and may be lawful for any ·son or persons to buy and sell goods and merchandise by any ights or measures established either by local custom or founded special agreement, provided always that in order that the ratio proportion which all such measures and weights shall bear to standard weights and measures established by this Act, shall be l become a matter of common notoriety; the ratio or proportion ich all such customary measures and weights shall bear to the d standard weights and measures shall be painted or marked ɔn all such customary weights and measures respectively." The mers of the Act must have been shortsighted indeed if they ever ɔected to abolish all old and local weights and measures, and roduce uniformity with such a permissive clause in the Act. The ısequence was what was foreseen by all capable of judging in : matter; the confusion became greater that ever, and the Legis-ure was obliged to interfere again. Accordingly, in 1835 an t was passed, repealing the said clause of the Act of 1824 in the lowing words:—"So much of the said recited Acts as allow the ; of weights and measures not in conformity with the imperial ndard weights and measures established by the said Acts, or allow ɔds and merchandise to be bought or sold by any weights or mea-·es established by local custom or founded on special agreement, ıll be and the same are hereby repealed." Again: "All local or ıtomary measures shall be abolished; and every person who shall

sell by any denomination of measure other than one of the im measures, or some multiple, or some aliquot part, &c., shall, on viction, be liable to a penalty not exceeding the sum of forty shil for every such sale." Again: "Every person who shall us weight or measure other than those authorised by this Act, or aliquot part thereof, or herein-before described, or which ha been so stamped as aforesaid, &c., shall, on conviction, forfeit a not exceeding five pounds; and any contract, bargain, or sale by any such weights or measures shall be wholly null and voi

We have thought it proper to quote these clauses from the to show the real position of the question, as many, not being a of the Act of 1835, have the impression that to produce unifor in the sale of grain we should have another Act passed enfo by penalty the sale of grain by the imperial quarter. It wi seen from the quotations that the Act of 1835 is stringent eno and all that is wanted now is that the authorities carry out the visions of the Act. We may as well, however, mention here, though the Act of 1835 appears plain enough, there is a di pancy in its interpretation between the English and Scotch ju In England there have been decisions which appear to favou opinion that local measures may still be used in transactions; it was found legal to sell wheat by the hobbett, a Welsh mea In Scotland, on the other hand, the reading of the Act has literally interpreted, and any bargain made by any local weig measure has been held to be null and void; as, for instance, selling of crop by the *Scotch acre*, or the measuring of drain the *Scotch chain*, or more recently the selling of potatoes by *boll*, even though in making the bargain the boll should be tioned to be of 4 or 5 cwt., or any other weight. This latter was decided by Sheriff Barclay, of Perth, the grounds of w decision are most ably given, and are well worthy of a perusa so far as Scotland, therefore, is concerned, there is no doubt o meaning of the Act, and all that would be necessary to produ uniformity of decisions in England and Scotland would be a declaratory Act.

Such, then, is the law regarding the selling of grain and farm produce; but what is the practice? Let every one an this question for himself by turning to the reports of the sal grain, &c. in the different market-towns of England, Scotland Ireland, where he will scarcely find any two of them alike, where he will be puzzled at finding the names of many weights and measures of which he never heard before. And has been studying these reports for some years, he will hav served in them the gradual substitution of weight for measu many places, in defiance of the threatened penalties of the A 1824 and 1835 against all who sell grain otherwise than b imperial quarter. Year after year the law is becoming mor

more honoured in the breach than in the observance—legal enactments are yielding to public convenience. Surely the law must have been framed on wrong principles, and its requirements must be felt as irksome and inconvenient, when such a decided and wide-spreading violation of it is being perpetrated in such a peaceable manner.

What are the objections of people to the statutory provision of selling grain by measure? The principal objection is, that it leads to disputes in transactions. Any one at all practically acquainted with the subject must admit this. There cannot be a more uncertain method of ascertaining the quantity of grain than by measure. Even in measuring liquids, due precautions must be taken to arrive at correct results, by attending to the force of attraction between the liquid and sides of the vessel. And if such difficulty is found in obtaining accuracy with an incompressible body as a liquid, how much greater must it be to get correct results in measuring such an article as grain, in which the pickles can be packed so closely to one another as to make a material increase in the quantity contained in the measure. Hence the quantity or weight of the grain in the measure will vary according to any circumstance which has a tendency to compress its bulk. Thus the greater the height from which the grain is poured into the measure, the greater will be its weight; any motion causing a vibration in the floor during the operation of filling the measure, will also cause the same bulk of grain to weigh more, by shaking the pickles closer to one another; the force with which the roller is placed on the measure before the grain is rolled,.will also cause a variation in the weight. In short, so liable is this method of selling grain to error from the trifling causes mentioned above, that seldom will the same man obtain the same result with scientific accuracy, when weighing the same grain; though we admit sufficient accuracy may be reached, with care, for all practical purposes. Need we be surprised, then, that differences in the weight per bushel, and in the quantities contained in any measure, so often occur, when the grain is weighed, first, say on the stone floor of a barn, directly from the fanners, and afterwards, under entirely different circumstances, on the wooden floor of the loft of the buyer; and need we be surprised at the disagreeable disputes which arise therefrom between buyer and seller? Hundreds of instances of this kind occur every week in the transactions between farmers and dealers, and between merchants in the same and in different towns. Let us take one: A farmer was in the habit of sending all his barley to a brewer, leaving the price to be fixed by him. Every lot sent in, when tested by the bushel measure of the brewer, weighed lighter than it did when measured on his farm; he sent his bushel measure to be tested by the Dean of Guild—it was found to be all right, and was stamped accordingly; but still

the same disparity continued in the weight per bushel of his barley when tested by his and the brewer's bushel, though the latter was also duly stamped by the Dean of Guild. Again, a farmer sold barley to a party in Edinburgh twice, and both times the weight per bushel on the farm and in Edinburgh differed: the average difference was half a pound per bushel, for which 4s. 6d. was withheld by the buyer for over-weight on the whole lot, which was 16 quarters, and the buyer retained into the bargain the half pound of barley per bushel which produced the over-weight, and which, for the 16 quarters, amounted to 64 pounds—equivalent in value to 4s. 6d., according to the rate at which the rest of the barley was sold. Thus, then, on these 16 quarters the farmer lost 9s., or more than 6d. per quarter, for giving what he thought was the just weight and measure of his barley; for the greatest attention was paid to the sacking of it. It may be asked, Why did he submit to the loss when he was so certain of being right? The barley was tested in the presence of his servants, and mixed with other lots before he was aware of the difference; and even though this had not been the case, his bushel measure was miles off, and there was the uncertainty of producing a result, under the different circumstances, the same as what he got at home, even though his own bushel measure were used. These are only two out of hundreds of cases that might be adduced, to show how those disagreeable disputes arise in grain transactions. Similar differences, only more aggravated by their magnitude, are as liable to occur in those large grain transactions which are daily taking place throughout the kingdom, while the course of trade is at the same time much impeded by the slow process of measuring instead of weighing grain.

Public opinion is divided as to the expediency of changing the method of selling by measure for that of selling by weight under present circumstances. We believe that all are agreed that the latter method is far better adapted for the convenience of trade; but some object to any change on account of the interference it will necessitate with private interests. We have, then, two parties—those who wish it legalised to sell by weight, and those who wish to adhere to the present system, the selling by measure. To the former class belong almost all the extensive merchants, millers, and dealers in corn throughout England, Scotland, and Ireland; to the latter belong principally a large proportion of those agriculturists who are accustomed to sell their grain in stock markets, such as Edinburgh, Dalkeith, &c.; while we have reason to know that in those districts where selling by sample is the practice, there is a pretty strong feeling among farmers in favour of selling by weight. And we may mention further, that farmers are gradually and tacitly giving in their adhesion to the selling of grain by weight, by their adoption of the practice of sacking their grain

irectly from the scales, without measuring any of it but the first our bushels. There is no doubt, then, that the great majority of hose connected with the grain trade, whether they be producers r purchasers, are in favour of selling by weight; and there is as ttle doubt that, even under the present law, far more grain is old by weight than by measure. We have, therefore, little hesiation in affirming that there is a great preponderance of opinion n favour of selling by weight.

Such being the case, it becomes those who are in favour of the resent system to give due weight to the opinions of the other arty. Let them not attempt to throw obstacles in the way of an micable settlement of the question. Let them not try to enforce he present law by penalties without due consideration. The first enalty imposed will be the knell of the present system; it will aise a storm that will not be quelled but by the sacrifice of that ystem which they are so anxious to uphold, viz., the selling of rain by measure. A question such as this is not to be decided by he exaction of penalties, but by the rules of justice, and by what s found best for the convenience of the public and the purposes of rade. Let them not be misled as to the state of public feeling nd the sentiments of Members of Parliament. The influential neeting held at Liverpool lately, which was attended by gentlenen connected with the corn trade, and representing various narkets in the country, was no bad exponent of public feeling. The following was the resolution unanimously adopted:—"That this meeting do therefore recommend to the trade in Liverpool, and elsewhere throughout the kingdom, that from and after the first day of February next, the weight of 100 lb. avoirdupois be adopted and used in all sales of grain, flour, and meal." And this was passed, let it be remembered, in the face of an existing statute, which enjoins the selling of grain by measure, and which some gentlemen consider it the wisest plan to enforce by penalties. And what is the feeling in Parliament? The proceedings of the last session will answer this question. Mr Bass introduced a short Act rendering the selling of grain by measure or by the imperial quarter compulsory, as in fact the present law does: it passed the first reading, but was thrown out at the second reading on the representation of one or two of the Chambers of Commerce throughout the country.

While we caution the one party against attempting to force upon the country a system which is found to be most inconvenient, we would urge upon the other not to be rash in resorting to legislation on such an important subject; for there are some strong reasons and serious objections against hastily substituting weight for measure in the sale of grain. At none of the meetings held to confer on this question have we seen the slightest allusion made to the manner in which grain is sold in other countries, if

we except only the great meeting at Liverpool, where it was stated by some gentlemen as a good reason for adopting 100 lb. as the standard weight for selling all kinds of grain, that that was the standard used in Canada. We have now a most extensive trade in corn with other countries; and it would be advisable, were any change made here, to communicate with the principal corn-exporting countries, so as to have one uniform standard over the world. We throw out this suggestion in the hope that it will be taken up by those who are moving in this matter. If there is the prospect of effecting this desirable object—viz., the obtaining a uniform standard over the world, say 100 lb. or its equivalent—it would certainly be better to delay making any change for a time.*

It cannot be denied that a serious objection against the change from measure to weight is the interference with private interests and arrangements which it will cause. In England, measure is sanctioned in the Tithes Commutation Act. In Scotland, rents are agreed on by the imperial bushel; ministers' stipends are paid according to measure; and many other private agreements are made which would have to be readjusted were there a change in the law. It might be said that grain might be sold by weight, even though these arrangements were in existence and unaltered. It could only be done by those who are never called upon to give evidence of the price of grain sold throughout the year for striking the fiars prices; but farmers and others who are summoned to give evidence in the striking of the fiars, must continue to sell by measure till some adjustment be made between weight and measure in present agreements, and the fiars be struck according to weight, and not according to measure, as at present. Now many consider this an insuperable objection to making the change from measure to weight. It is no doubt, at all times, with great reluctance, and not without strong reasons, that the Legislature would sanction any measure which would disturb existing agreements between private individuals. But if this can be done with justice, and the consent of all parties, the objection vanishes. Now we do not consider the present method of striking the fiars prices (we allude to them particularly, for it is by them that all agreements in grain in Scotland are settled) such an insuperable objection. When the Act of 1824 was passed, it was provided that juries were to be sworn in every district and county where it was necessary to make the proper adjustments in private agreements between the old system and that introduced by the Act,

* While this paper is passing through the press, we have heard that a meeting of merchants was held at Berlin about the 11th of last month, at which it was agreed to cast aside measure (except as a mark of showing quality), and to sell all grain by weight—wheat, rye, barley, and oilseeds, per 2000 lb.; oats per 1200 lb.; other seeds and potatoes, per 100 lb. In all changes that have been recently made in the standard of selling grain, 100 lb., or a multiple of it, has been fixed upon as the most convenient, and in anticipation of the decimal system being adopted [illegible]

which was the uniformity of weights and measures. And if it was done before, why cannot it be done again? We would have as much confidence in the verdict of such a jury as we have in the results obtained according to the present haphazard method of striking the fiars. There is no subject on which legislation is more called for than the fiars; and we are glad to find that the county gentlemen of Edinburgh, having called the attention of the Commissioners of Supply throughout Scotland to the irregularities and uncertainties of the present method, we are now on the eve of legislation on it. A more favourable opportunity then could not be got for effecting the change from measure to weight, so as to conform to the plan now advocated of selling grain by a uniform standard of weight. We rejoice to think that the fiars prices are brought forward as an objection to the change from measure to weight in the selling of grain, as the whole subject will then be brought before the public, and its weak points exposed. We are as desirous of having an improvement in the method of striking the fiars prices, as we are of being allowed by the law to sell grain by weight.

It will be asked, How is it practicable to adjust present agreements if the change be effected of selling grain by weight instead of measure? We suggest with much diffidence a plan which has occurred to ourselves. Let a jury of proprietors, tenants, and others interested, be impanelled, and evidence be led before them of the weight of the grain per bushel or per quarter for a number of years; let the average of the several weights given in be struck. The average thus obtained will be held to be the average weight of grain grown in the county for which the evidence was led, and will be used for converting the measures of grain mentioned in particular agreements into the relative weights. Thus, supposing that the rent per acre of a farm in a particular county was 4 bushels of oats, 3 of barley, and 2 of wheat, and that the average weight per bushel for that county was found to be 42 lb. for oats, 55 for barley, and 62 lb. for wheat, then the converted rent would be 168 lb. of oats, 165 of barley, and 124 lb. of wheat; and as the fiars prices would be struck at so much per 100 lb., it would be easy to reduce these to their money value.

As it is always safe, at the commencement of any agitation for the change of a system, method, or practice, to bring the difficulties prominently forward tending to prevent such a change, so that each may be met on its own ground, we have been desirous of doing so at present. We will therefore mention as another objection to the change from selling by measure to selling by weight, the alteration that will be necessary in the Excise laws in the collection of the malt-tax. But if the Legislature consent to make the selling of grain by weight legal, all these difficulties would soon be swept away, as, in our opinion, they are not so great as at

first sight they appear to be. But it is necessary that they sh all be mentioned, so as to meet with due consideration before great change is made.

The question of selling grain by weight is somewhat complic by not a few insisting that it should be made law that the nat weight per bushel, or any other imperial measure, should al be mentioned in any sales of grain. It does appear strange that those who are anxious to abolish the selling by measure, sh still insist upon retaining a measure in transactions in grain any such measure be used, the same liabilities to disputes remain as are complained of at present. We have seen, in cases adduced in this paper, that no two men will fill a b measure, with the same grain, so as to obtain the same we Why, then, go to the Legislature and demand that the s by the quarter should be abolished, and at the same time that an aliquot part of it or itself be retained for use, to aid them in judging of the quality of the grain? Th surely great inconsistency here. Though the weight per bus grain, or its specific gravity, is mentioned now in transactions, is no law compelling the stating of it, but it has simply becon practice to do so, and that only within a few years; for the ti not long past when all grain was sold by measure, withou reference whatever to weight. We understand that it is nc intention of those who adhere to the resolutions passed at the pool meeting, to petition in favour of the bushel, or any me being retained to aid the parties buying and selling to judge quality of the grain. A good judge of grain does not requ know its specific gravity; he will tell the value of it merely by ling and seeing it. A knowledge of the natural weight per weight, or, what is the same thing, the specific gravity, how will be an aid to those who have not sufficient skill or exper and if it is found necessary to continue the practice for such, i be done without rendering it compulsory by law. There are conditions often stated in making bargains, which are only bi on the parties immediately interested; and the specific grav grain may, with great propriety, form one of these condi indeed it would be an important element in bargain-making. are not of the opinion of those who maintain that the weig bushel of grain is the principal criterion of its value. W agree with them so far, that it is only one of the standards of ing of the value. Dantzic wheat, for instance, weighing 62 lb. per bushel, will often bring 7s. or 8s. more per quarte some of our Scotch wheats weighing 65 lb. per bushel. S wheat grown in East Lothian will command a higher pric wheat grown in some of the higher districts of Mid-Lothian, the latter will weigh more per bushel. The practice follo Edinburgh market is reckoned a model; we take up, theref

ndom the report of that market of 8th December, and we find here that wheat weighing 63$\frac{3}{4}$ lb. brought 41s. and 48s.; and eighing 59$\frac{3}{4}$ lb., brought 39s. and 43s. 6d.; so barley, weighing 5 lb., brought 27s. and 32s. 6d.; and oats, weighing 41$\frac{1}{2}$ lb., brought 2s., while that weighing 41$\frac{3}{4}$ lb. brought only 21s. 3d. But why hould grain be made an exception to the ordinary practice of ealing in the other articles of consumption? There is surely as reat difference in the specific gravity of the varieties of coffee as here is in that of grain; why then do we not insist upon knowing he specific gravity as well as the weight of coffee when we purchase? Why should the dealers in grain not be as good judges of he quality by looking at it and handling it, as the dealers in all ther articles? If it be found just, wise, and expedient to sell these articles by weight, which vary as much in specific gravity as grain, why should we be enjoined by Act of Parliament to adopt a more uncertain method for the latter? We may be sure that the common-sense of the country will not much longer tolerate such an anomaly, and that sooner or later we will have all the grain in the country sold by weight, which is the most natural, as it is the most correct and unvarying, standard of quantity.

BRITISH GRASSES.*

WHETHER considered in a botanical or economical point of view, the family of the grasses is one of the most interesting and important that can claim our notice. Yet in neither of these lights can the subject be said to have received that degree of attention to which it is entitled. The descriptions in our native floras are often defective and inaccurate, the distinctive characters not judiciously selected or clearly brought out, and the notices of the localities, or natural places of growth, often calculated to mislead. In regard to their agricultural and nutritive value, few continuous and trustworthy observations have been recorded since the publication of Sinclair's *Gramina Woburnensis*, now a work of rather old date. The two publications whose titles are given below, regard the subject both in a scientific and practical point of view, and profess to supply most of the useful information that has been recently acquired respecting our native grasses. Professor Buck-

* *The Natural History of British Meadow and Pasture Grasses, with an Account of their Economy and Agricultural Indications.* By JAMES BUCKMAN, F.L.S., &c., Professor of Natural History in the Royal Agricultural College. London, 1858.

The Grasses of Great Britain, illustrated by JOHN E. SOWERBY; described, with Observations on their Natural History and Uses, by CHARLES JOHNSON, Esq. In Parts. London, 1857, &c.

man's work gives the results of personal observation and experi ment, and the other not only affords a description and gene history of them, but a coloured representation of every speci found in Britain. These figures are not executed in the highest most elaborate style of the art, but they are upon the whole faith ful and characteristic, and will enable the student to identify an species he may wish to examine. And this advantage, obtainab at an outlay comparatively trifling, will, we hope, induce farme to make themselves better acquainted than they usually are wi this interesting tribe of plants, and learn the name and histo of every kind growing naturally in their pastures or cultivat fields.

Nothing can be more easy than to determine the family. Th long, narrow, linear leaves, with longitudinal parallel nerves; th social habit, and the general tendency, when eaten down, t tiller out into a matted and continuous turf; the round slend culms, with their remote nodes; the bunches or *locustæ* of flowe with their peculiar envelopes, glumes, and glumels, like a seri of little nests, one within another—constitute a peculiar aspe or *facies,* as botanists call it, which is not easily mistaken. S extensive is the family, considered in a general sense, that it h been estimated to compose $\frac{1}{22}$ part of the entire amount of existi plants. The most recent British flora* we have seen gives their nu ber in our own island as 130, or, including doubtful species, abo 140; so that the amount has, of late years, received a considera increase. But though thus easily distinguished as a family, it often a very difficult matter to discriminate the different speci for many of them have not only a close resemblance to each oth but they are liable to variation according to the locality in whi they grow. Yet, notwithstanding their general resemblance, is found, on examination, that they present an immense numb of curious and interesting modifications in the different speci in respect to structure, habit, or mode of growth, localities whi they affect, mode of propagation, geographical distribution, a also, in a remarkable degree, in nutritive value, considered as fo for cattle. These circumstances at once serve to distingu species, and to give an additional interest to the study.

The primitive mountains of the north of Scotland, and t comparatively recent geological formations of southern Engla are alike covered with a vesture of verdant turf; but if we w examining the individual grasses of which it is composed,

* *The Illustrated Handbook of British Plants.* By ALEXANDER IRVINE, F 1858. A meritorious work, containing a description of all our native plants, much general matter, sometimes not a litte curious, regarding them, and pict illustrations of the different families; at a price unusually low for publicatio this nature.

should find it to consist principally of different species. Difference of climate, soil, situation, latitude, &c., acts upon these plants much in the same way as it does on others of larger growth and more ample foliage, and the effects are conspicuous even in so limited an area as this country presents. Some species are found in the south of England, which disappear before we reach the midland counties; others again extend northwards, but do not cross the Border; while the high lands of Scotland possess certain alpine species to which the south cannot afford their appropriate localities. One of the obvious purposes which nature has intended to serve by this family of plants is, that they should yield a ready and wholesome food for man and animals; hence they are not only adapted by their nature to a wide diffusion, but also to flourish in the diverse localities presented by the surface of any one country. The former is strikingly seen in the cereal grasses, which prosper wherever man, if he had the liberty of choice, would probably choose to dwell; others, fitted only for pasturage, are still more widely spread. A species of *Trisetum*, though not occurring in Britain, may almost be said to be cosmopolitan, ranging through 128½° of latitude. Our common annual meadow-grass (*Poa annua*) is very widely distributed, occurring in all the four quarters of the globe, and extending as far north as Iceland: its range in regard to altitude is likewise considerable, and it sometimes accompanies us on the Highland mountains nearly to the region of snow. In the lower districts, no place comes amiss to it; it springs up as if its seeds existed everywhere; flowers and seeds the whole year, without even excepting winter; accompanies man in all his migrations, and appears as surely as the nettle wherever there has been a human habitation. The name Alpinus, by which several species are distinguished, indicates their alpine and sub-alpine habitats. Sheep's fescue-grass (*Festuca ovina*) has a general range from the south of Cornwall to the summits of the Grampians, upwards of 4300 feet in elevation; nay, it sometimes occupies the highest land in Britain, and may be seen braving the storm near the summit of Ben Nevis and Ben-na-muic-dhui, along with *Carex rigida* and the herbaceous willow. To fit it for holding its ground on the extreme limits of vegetable life, it becomes viviparous,—a beautiful provision, by which the seed germinates and produces incipient leaves and roots before leaving the maternal plant, when it drops to the ground, ready to take root, and commence an independent existence.

But not only is the geographical range of these plants extensive, the part intended for them in the economy of nature is as strikingly shown in their adaptation to different localities in the ordinary surface of a country. There is scarcely any ground or description of surface which has not its peculiar species. Thus,

some are aquatic; some marine, or confined to the sea-shore; others are woodland, or grow under trees and among brushwood; others, our chief pasture-grasses, prefer meadows; and not a few may be called, to use Professor Buckman's term, agrarian, frequenting cultivated fields, or forming fallow-grasses. Moorlands have a very characteristic gramineous vegetation; and chalk soil, which supports so many plants of its own, has likewise its peculiar grasses.

Although the general effect of mixed grasses is to produce a lively and pretty uniform tint of green, yet when examined separately they are found to present great varieties of hues and shades of colour. Some are light, others dark green, some yellowish green, and not a few with a mixture of blue, producing that peculiar tint called glaucous. The latter is particularly observable in the kinds growing on the sea-shore, so marked that their habitat may be known by this circumstance alone, an effect probably of the sea air; although a similar tendency is occasionally remarked where this influence cannot operate. A similar diversity takes place in their mode of growth, very obvious when their natural habit has not been altered by cultivation, but which even that influence cannot altogether overcome. These are named, by Professor Buckman, jungle or bush grasses—the latter term being most applicable to those of this country. They have a disposition to grow in distinct tufts or bushes, not tending to form a matted turf, but to mix with shrubs, or grow as separate plants beneath trees, maintaining this distinctive form even in meadows. The chief of these are the turfy hair-grass (*Aira cæspitosa*), narrow-leaved oat-grass (*Avena pratenis*), slender false brome-grass (*Brachypodium sylvaticum*), tall fescue-grass (*Festuca elatior*), sheep's fescue (*Festuca ovina*), and cocksfoot (*Dactylis glomerata*). "These always grow in tufts when sown thin for permanent pasture, if the land be poor, but is soon prevented by depasturing, bush, or fine-tine harrowing and rolling. These operations take away all mosses and dying grasses which have a tendency to rot, and thus form a humus soil around the roots—a circumstance prejudicial to the growth of good turf. Rolling presses the whole together, and makes the soil firmer—a matter of great consequence in forming a pasture. Indeed, fertilisers and mechanical processes may be looked upon as the means which, after all, keep meadows in the form we now see them. As in truly wild nature there would be a greater tendency to a distinctive mode of growth than to the formation of a matted turf, so even simply depasturing supplies to a considerable extent all the requisites I have adverted to as necessary for the prevention of the jungle mode of growth, in many even of our meadow grasses." *

* Buckman, p. 6.

Aquatic grasses are not numerous, at least such as grow *in* the water; nor are they, as may be expected, of much agricultural value. Common reed (*Arundo phragmites*) and reed canary-grass (*Phalaris arundinacea*) are the most conspicuous, and their rough harsh foliage is scarcely ever touched by cattle. Two of the sweet grasses (*Glyceria aquatica* and *G. fluitans*), on the contrary, are much sought after, and cattle frequently incur the risk of getting imbedded in marshes in pursuit of the latter, which alone is common in Scotland. Several kinds grow in marshy places, such as the floating foxtail (*Alopecurus geniculatus*), water whorl-grass (*Catebrosa aquatica*), &c. When any of the latter species are found growing on what may appear a comparatively dry surface, it may be safely inferred that the soil is wet and swampy below, and that draining is requisite.

The majority of grasses, by means of their fibrous roots, creeping rhizomes (or underground stems), and matted growth, are well fitted to bind together and consolidate thin, loose, and sandy soils, and this office is quite consistent with their primary one of yielding a supply of herbage. But in the marine grasses the latter purpose is entirely suspended, and the former function alone devolved on them. They are so singularly harsh and rigid that no animal will touch them. The underground roots grow with extraordinary vigour—specimens of one of them have been found thirty feet in length; and they form a matted network exceedingly well fitted to arrest the shifting sands. *Ammophila arundinacea* is by far the most common of these useful grasses, and it is usually associated with a species of *carex* or sedge very similar to it in quality.

Agrarian grasses, or such as most frequently appear in ground under tillage, are pretty numerous, and, in such circumstances, have sometimes the character of very troublesome weeds. Professor Buckman gives the following list of them:—Wild oat and bristle-pointed oat (*Avena fatua* and *A. strigosa*); slender foxtail (*A. agrestis*); three species of brome-grass (*Bromus mollis, secalinus*, and *sterilis*); three species of poa, the rough (*P. trivialis*), annual (*P. annua*), and flat-stemmed (*P. compressa*); couch-grass (*Triticum repens*); and creeping bent-grass (*Agrostis stolonifera*). Wherever these are found in any plenty in cultivated lands, they indicate either a low state of fertility or bad farming, in most cases probably both.

Under the head of Meadow-grasses may be arranged most of the kinds which are most beneficial to us, either as yielding hay or pasture for cattle. These Professor Buckman distributes under the following heads:—1, Upland pastures; 2, Poor stiff soils,—"hungry clays;" 3, Rich deep loams; 4, Meadows subject to periodical floods; and, 5, Irrigated meadows: and he gives us, in a tabular form, some very interesting results as to the *proportionals*

of each species in their different situations, showing where they reach the minimum and maximum state of abundance, or, in other words, the preference they have for one set of circumstances rather than another. Some of these results are sufficiently remarkable to deserve notice. As a general rule, they may be said to reach their maximum in irrigated meadows; others, on the contrary, either do not flourish there, or soon die out. Meadow foxtail in such situations increases rapidly, and is as three to one or two compared with any other locality. Cocksfoot is most abundant and luxuriant in flooded and irrigated meadows; so is field meadow grass (*P. pratensis*). Oat-like grass (*A. avenaceum*) is most abundant in poor clayey soils, in rich loams decreasing from the proportion of three to one; and in irrigated situations to 0. Sheep's fescue is in the proportion of 4 in upland pastures, and in other situations it stands at 0. Quaking-grass (*Briza media*) is most plentiful on poor clays, decreasing rapidly on rich loams, and is represented in irrigated places by 0; indeed, in the last-mentioned localities it dies out in two years, although plentiful before irrigation. This is likewise the case with the valuable dogstail grass; after two years' irrigation it decreases by a proportion of one-half, and after four years entirely disappears. Turfy hair-grass (*A. cæspitosa*) deteriorates even more rapidly, disappearing after two years' irrigation. Many other grasses, on the contrary, undergo a progressive increase when irrigated. Marsh bent-grass (*Agrostis stolonifera*), cocksfoot, yellow oat-grass, meadow barley-grass (*Hordeum pratense*), although previously existing in the proportion of 1, attain to 2 the second year, and to 3 after four years. Under these circumstances a rapid augmentation is exemplified by perennial ryegrass, which, from a proportion of 2 before irrigation, after two years' irrigation is represented by 4, and after four years by 6. The soft oat-grass (*A. pubescens*) presents the anomaly of retaining the same relative proportions both before and after irrigation, even when subjected to the process for a series of years.

These facts, determined by long-continued observation and experiment, show in what situations and circumstances grasses may be expected to be most productive, and that these situations are very various, as might be presupposed from the consideration previously adverted to—namely, that they have an important part assigned to them in the general covering of the earth's surface. One of the general results is, that, under irrigation, the better class of grasses, with very few exceptions—among these rough meadow-grass (*Poa trivialis*), and meadow barley-grass (*H. pratense*)—increase sometimes with great rapidity; while the less valuable kinds have a tendency to decrease, and in many instances wholly to disappear. But the advantages of irrigation are strikingly evinced by this further circumstance, that other

plants, of an innutricious nature, disappear even more rapidly than the less valuable grasses, and leave the space to more worthy occupants. Two of the most common crowfeet (*Ranunculus acris* and *bulbosus*) which usurp so large a surface in our meadow-lands, are greatly reduced after four years' irrigation, if not extirpated. Such is likewise the case with the plantains, and is particularly observable in the Dutch clover. Docks, however, increase under the process, and it would probably be found best that these should be eradicated by hoeing.

A considerable number of grasses, approaching to a fourth part of the whole, are annual—that is, die after ripening their first seed; a few are biennial, or flower for two years; the rest perennial, or flowering for several years. Even the same genus sometimes contains both annual and perennial species. Connected with this is the singular fact that annual species can be converted into biennials, by preventing seeding; as if the life of the plant must needs be prolonged till it has secured the means of continuing its kind. This is the same thing that is exemplified in insects, in many of which the duration of life can be continued for a season beyond the natural time, by preventing the meeting of the two sexes. "In October 1849," says Professor Buckman, "I planted a patch of wheat in one of my experimental plots of 5 square yards; this I kept continually cut down during the summer of 1850, and it stood the winter of 1850-51, and became a tolerable crop in the summer of 1851, though much of it had died in the mean time. Oats and barley, treated in the same way, soon died out. Now, these experiments show, that not allowing seeding in due season has a tendency to prolong the duration of the life of plants; it is upon this principle in depasturing that our meadows maintain their position as continuous patches of herbage. Constant haymaking would inevitably promote the dying-out of good grasses, and this the more readily the older the grass be before being cut, so that in all cases it is the greatest possible mistake not to make hay early. Otherwise what is gained in quantity is mostly prejudiced in quality, and the after-consequences are always unfavourable—circumstances arising not solely from the impoverishing of the soil." It is very interesting to observe the wonderful care nature has taken, in another respect, to secure the seeding of these plants. When once the culms grow up and flower in pasture-lands, they are seldom eaten down by cattle; and yet the same culms, if cut down and converted into hay, would be eaten with avidity. In other cases, again, where the plants do not seed readily, such as the soft-grass (*Holcus lanatus*), propagation is rapidly carried on by the roots,—the supply thus carefully provided for in every contingency.

Keeping in mind one of the obvious purposes of gramineous plants, it is impossible not to be struck with the fact that compa-

ratively so small a number of them have become agricultural plants, or are employed for feeding purposes. Some of the kinds which grow to the greatest height, and throw out the greatest quantity of foliage, and which would seem therefore most deserving of attention in an economical point of view, have scarcely been converted to any use. And yet, in a tribe so strictly natural, it can hardly be supposed that their essential properties should differ so materially as to render this inevitable. So far as chemistry has made us acquainted with the ingredients in their constitution, nothing appears to warrant this restricted use. When animals reject them, therefore, it is probably owing to something in their mechanical structure which might possibly be got over by converting them into hay, or subjecting them to pressure; or it may arise merely from their being unaccustomed to them. One of the finest-looking of our native grasses, growing abundantly in woods, and in the vicinity of bushy places, throughout the south of Scotland, is the slender-false brome-grass (*Brachypodium sylvaticum*). It appears early in the spring, continues green to a late period in the autumn, throws out a great profusion of broad, soft, light-green leaves, and grows in tufts, commonly arranged in circular patches. It is certainly true that it never appears mutilated by the browsing of wild animals; and owing to the places where it usually grows, it is not often accessible to sheep or cattle. It would thus seem that its very beauty must be regarded as a proof of its inutility, in any other light than as a shelter for game, for which it is well adapted. We are told that it is usually rejected by all kinds of animals. The conclusion that it is of no agricultural value has, we cannot help thinking, been too hastily formed. It is included, we percieve, in a list of grasses experimented on by Mr Stirling of Glenbervie; and it is certainly well worthy of further trial. A field of it would be a pleasing object to the eye; and the amount of herbage, possibly available in the form of hay, if not otherwise, could not fail to be great.

Another of our woodland grasses, which we would fain see enlisted in the service of the farmer, is one found plentifully in the south of Scotland, the hairy-wood brome-grass (*Bromus asper*). It is often associated with the tall fescue (*F. gigantea*), and they rival each other in height and beauty, greatly overtopping all the other land-grasses. The one in question is easily distinguished by its dark-green colour, sheath rough with deflexed hairs, and short awns. The leaves are large and flat, spreading, and produced in great profusion; and the whole plant, when growing upon a wooded bank, has a conspicuous appearance, with its tall culm, and large, lax, elegantly-drooping panicle. The plant is somewhat rough, as the name implies; but when we can render common furze a palatable food for cattle, this should not form an insuperable obstacle to its use. One of the most abundant grasses

on moorlands, and to all appearance one of the most unprofitable, is the *Nardus stricta*, or mat grass. It forms compact tufts of glaucous, furrowed, rigid leaves, almost as stiff as a piece of wire, from which rise short culms bearing bluish spikelets, with the florets on one side. Professor M'Gillivray informs us that he was assured by a Highland farmer that, when in extremities, and glad to eat carices and luzulæ, or wood-rushes, sheep never touch this repulsive grass.* But this is only when the season is advanced, and the plant full grown: we have seen the young leaves nibbled down in spring, as they began to project from among the old ones; for both leaves and stems continue through the winter, and perish only in the succeeding spring or early summer.

These observations, however, our space does not permit us to extend. Judiciously-managed and long-continued experiments on the grasses would lead, we are persuaded, to very important results, both in a botanical and agricultural point of view. Not a few of those now regarded as distinct species would probably be found mere varieties of each other; some now neglected might be found fitted for cultivation, or hybrids might be reared, possibly superior to any now in use. Unexpected results have arisen from some of the experiments made in the garden of the Royal Agricultural College at Cirencester, as detailed in the little work of Dr Buckman, already referred to. "Two years since," it is stated, "we sowed a plot of *Poa aquatica* and *P. fluitans*, which soon came up very well, but did not flower until the second year, when, to our astonishment, the crops of the two beds were entirely alike in all the details of their leaves and flowers; the new plants, however, being so entirely distinct from either of the originals, and from every other known British grass, as to present a matter of interest for further investigation; and in order to this, we have this year endeavoured to collect wild seeds of the two forms in question, but, as regards *Poa aquatica*, entirely without success, as, though a wide district has been carefully examined, in no instance have we succeeded in finding any fertile seeds. Plants, therefore, of the two forms have been obtained from the Cirencester Canal, and planted in our experimental plots; and if it should be ultimately proved, by repeated and varied experiments, that a change of habitat from a residence in water to one in dry land is capable of producing so great an alteration in specific details, it will afford another interesting proof of the curious physiological facts which are to be elicited from experiments on the cultivation of grasses."

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* *Natural History of Deeside and Braemar* (printed for private circulation), p. 149.

PATENT SPECIFICATIONS RELATING TO STEAM-CULTURE.

In former papers we have from time to time given short abstracts of the specifications of patented inventions which have presented features we deemed likely to interest our readers: we now supplement these by a short paper on the patented inventions relating to steam-culture. The first patent in this interesting and now highly important department of mechanism dates from a very early period (17th January), namely 1618. The subject of the patent, which was granted to David Ramsay and Thomas Wildgoose, was for a "newe, apte, or compendious form or kind of engine or instrument, and other profitable inventious invencons, wayes, and means for the good of our commonwealth, as well to ploughe ground without horse or oxen, and to enrich and make better and more fertile as well barren peat, salt and sea land, as inland and upland ground." To David Ramsay, one of the above patentees, were granted two other patents, one dated January 21, 1630, and January 29, 1634; from which it seems likely that he proposed to use the power of steam for the above purposes; for in the patent of 1630 the following sentence occurs in the claim made: "To raise water from low pitt by fire; to make every sort of mill; to goe on standing waters by continuall mocon, without the helpe of wind, water, or horse."

The patent granted July 17, 1634, to William, John, and Ambrose Parham, and T. Dornay, seems to have been for a species of windlass or engine to be enforced by the "labour and strength of two men onlie," for the "earinge and ploughing of land of what kind soever, without the use or helpe of horses or oxen."

Francis Moore, March 14, 1769, applied for a patent for "machines and engines," which, he humbly conceived, "would be of great utility to our subjects in tilling, improving, and cultivating lands." As no specification of this was enrolled, it is impossible now to know the nature of the machines proposed. That great things were thought likely to be done by them, is evident from the following extract from the *Leeds Mercury*, of April 11, 1769 — which the industry of Mr B. Woodcroft, of the Patent Office, has rescued from oblivion—in which a correspondent draws attention to the fact that they were not only capable of being applied to the drawing wheel-carriages in general," but to "plowing, harrowing, and every other branch of husbandry;" and this so effectually and certainly, in the inventor's own opinion, that he "sold all his own horses;" and not only this, but had prevailed—which is more difficult to do—upon many of his friends to do the same, "because the price of that noble and usefull animal will be so affected by his invention that their value will not be one-fourth of what it is

at present." It is no new thing to read of the faith of invention; it is, however, a greater novelty to read of the facility with which inventors indoctrinate their friends with their own faith, as appears to have been done in this case.

On July 13, 1769, Francis Moore took out a patent for "new machines and engines," capable of being wrought or put in motion by force or power without being drawn by horses or any other beasts or cattle," which, upon "repeated trials," he discovered, would "be very useful in agriculture."

John Danbell, in his patent dated February 4, 1808, proposed the use "of a peculiar kind of portable or travelling engine, for drawing or impelling ploughs and other agricultural implements," the steam employed being made to act on a series of vanes attached to a wheel, the motion of which was imparted to the travelling-wheels of the carriage by suitable gearing.

The first important patent embodying claims for mechanism of a pretentious character, for machine culture, is that of Major Pratt, dated February 26, 1810. The claim which has the closest resemblance to those of more recent date is the fourth, for ploughing by means of "three or four wheeled carriages, which travel along the field parallel to each other, with two endless chains extended between them, and passing round a single horizontal chain-wheel on the outer carriages, and around a double chain-wheel driven by mechanical power in the centre carriage. Ridge-ploughs being attached to the chains, two ridges will be ploughed at the same time between the centre carriage and each outer carriage." The eighth claim of the patent was for a "plough which appears like two ploughs fixed back to back (as in some kinds of turn-wrist ploughs), and is drawn alternately in opposite directions by a chain and wheel, like those used in Baker's patent mangle." The number of this patent is 3309, dated February 26, 1810, and the price 1s. 5d.

In the patent granted to Thomas Tindall, June 18, 1814, a portable or travelling steam-engine is proposed to be applied to the dragging of ploughs or agricultural implements. The power of the engine comes "from pushers or legs at the back of the carriage, to come successively in contact with the ground, and impel the carriage."—No. 3817; price 1s. 2d.

The patent of Joseph Reynolds (dated January 9, 1816) is also for a steam-engine travelling over the land to be cultivated, dragging with it the implements used for this purpose. There are some points of mechanical interest in this patent which have not been overlooked by succeeding inventors; amongst these is a method of turning the engine in a very small space. "The carriage is supported at the front by a single wheel, and at the back by two very broad wheels or rollers, which sustain the principal part of the weight of the carriage. The latter wheels are

capable of rotating independently of each other, and to the main side of each a toothed wheel is affixed. The power of the engine is communicated to these wheels by an arrangement of toothed gearing, which can be so adjusted as to cause one broad wheel to rotate in one direction, whilst the other broad wheel is rotating in the opposite direction."—No. 3973; price 1s. 1d.

The patent granted to J. H. Clive (dated July 1, 1830) is of the same class as the two last described; namely, a travelling engine dragging the cultivating implements over the land to be ploughed, &c. A claim is made for a steering apparatus, and for the use of a broad wheel in the centre of the engine, to be used when traversing in a curved course.—No. 5950; price 4d.

The patent granted May 15, 1832, to John Heathcoat, embraces claims for the machine which was tried many years ago under the auspices of the Highland Society, and which attracted a considerable amount of attention at the time, from its apparent utility in the cultivation of mossy or boggy lands. The principal feature in the invention was the use of wheels of large diameter, carrying an endless flexible floor or railroad, within and upon which the carriage travelled by the power of the steam-engine employed, and which, with the necessary gearing, was supported by the carriage. The other feature was the employment of "auxiliary carriages," placed on each side of the principal carriage, at some distance from and parallel with it. Actuated by the steam machinery in the principal carriage, a series of ropes or chains were led out to wheels, pulleys, or barrels on the auxiliary carriage, to which motion was thus imparted. To these carriages the ploughs and other implements were attached, and which were caused to move along the field at a corresponding rate with the principal carriage.—Number of the patent 6267; price 2s. 3d.

The patent (dated June 17, 1839) granted to A. T. Campbell and C. White, claims a method of combining a series of ploughs in a diagonal line, to turn over all the land on one side, the plough-frame being drawn by power, "whether from a fixed or other engine, or otherwise." The plough-frame is carried by three wheels, two being in the fore carriage, the third on the hind carriage: this third wheel rolls in the furrow made by the last turn; the object of the arrangement being to "plough a considerable breadth of land at one time."—No. 8108; price 5s. 2d.

The patent granted to Henry Pinkers (dated August 26, 1839) presents some novel features. By the method proposed, a series of mains or pipes are to be laid down in the fields to be cultivated, connecting these with a central station, at which a steam-engine is to be placed, the power of which is to exhaust the range of pipes of air, and create a vacuum in the same; a pneumatic atmospheric auxiliary power is obtained in this way suitable for the working of agricultural implements. To the underground pipes vertical

branches are attached at intervals; with these, engines are temporarily connected. These are so constructed as to be worked, by means of a vacuum, with atmospheric pressure. Each engine carries a revolving drum, round which is coiled a flexible tube, the outer end of which is necessarily fastened to the vertical branches named above; the inner end being attached to a chamber communicating with the cylinders of the engine, and thus puts them in connection with the vacuum-pipes. As the engines move along the field, the drum revolves and winds up the flexible tube as it approaches the vertical branch of the vacuum-pipes to which it is attached. In deep ploughing, the forward motion of the engine may be assisted by employing a rope or chain fixed at a given point in the field, and passing round a pulley worked by the engine. To prevent the engine sinking in boggy lands, a metal rim is proposed to be attached to the periphery of each wheel, and a sheet or endless apron of coarse-meshed gauze stretched round the fore and hind wheels. The wheels will run upon this apron, and transmit the weight of the engine over a larger surface of ground. A modification of this plan we find exemplified in a very recent patent, and proposed for a similar purpose.

Instead of travelling over the land, the patentee proposed the power of the engines to be used for giving motion to endless ropes or chains, to which the implements were to be attached; such method being, as he conceived, "particularly adapted to till hilly lands, where a roping system may be so applied. On the steep inclinations of hilly lands, a well-known system of pulleys, called the differential pulleys, may be combined with the said impelling engines."—No. of the patent, 8207; price 4s. 2d.

The patent granted December 24, 1839, to Alexander M'Rae, was for mechanism applicable to the steam-ploughing of lands in British Guiana, where the fields are very flat, and separated from each other by navigable canals parallel to and distant from each other some 200 to 300 feet. The arrangements proposed are as follows: Punts are moored in two adjacent canals, the land to be cultivated being placed between them: one punt carries a steam-engine and a winding-drum, the other punt simply carries a pulley. To a four-wheeled carriage is attached the ploughing or tilling implements. From this carriage a chain or rope is led to and passed round the winding-drum; it is thence led across the field, supported by several rollers attached to the under-side of the carriage, and finally passed round the pulley in the second punt. The engine turns the winding-drum in opposite directions alternately, so as to draw the carriage and its tilling implements to and fro across the field. The punts are simultaneously moved to a new position on the plough-carriage completing its traverse. Two sets of ploughs are attached to the carriage, one to work

while it is traversing in one direction, the other set while traversing in the opposite direction.—No. of the patent, 8329, price 3d.

The patent granted to John Leo Nicholas, January 1, 1840, is the first met with in which a claim is made for a steam-travelling engine with endless railway, calculated to traverse over boggy and soft soils. To the engine a series of pendants or legs are attached, each provided with a shoe at its lower end: these legs are successively pressed downwards and backwards, thus causing the engine to progress, over the land. For boggy, marshy ground, the portable railway is attached: it consists of a series of boards with raised sides, and with roughened surfaces to enable the shoes of the legs above noticed to take a firm hold of them. These boards are used to support the shoes of these legs, and to prevent them from sinking into the ground. As soon as the shoes are removed, the boards are lifted up by levers and carried forward by means of an endless cloth to the front of the machine, where by levers they are lowered to the ground-level. "At the time that the lower ends of the pendant legs are acting against any particular board, the running-wheels of the carriage are passing over that board, which is thereby prevented from slipping away."—No. of the patent, 8331; price 1s.

Henry Pinkers, in his patent, dated September 24, 1840, proposes to use "electricity" for the working of agricultural implements. The arrangements are very similar to those described in his patent, formerly noticed, No. 8207. The number of the present patent is 8644, and its price 6s. 8d.

Although not coming strictly under the title of our paper, we may here notice the patent granted, April 2, 1844, to Wm. Stace and Philip Vallance, for a method of ploughing by the power of windmills. The implements are attached to an endless rope, which passes round from shifting-pulleys, which derive motion from windmills, one at the opposite corner of the field, the rope taking the following course: "From the first windmill it passes to a pulley on the same side of the field, thence across the field to a pulley on the opposite side, and onward to the second windmill; from this machine it proceeds to a second pulley on the same side, then passes across to the second pulley on the opposite side of the field, from which it returns to the first windmill."—No. 10,135; price 2s. 1d.

The principle of the "atmospheric railway" is proposed to be applied to the working of engines for the dragging of tilling implements over land, in the patent granted, February 11, 1846, to T. Clarke, M. Freeman, and John Varley. The ploughs to be used are fixed in a diagonal line across the frame, and drawn over the land in alternately opposite directions—by the power of two locomotive engines—by ropes or chains fixed to the opposite end of the plough-frame, these other ends being wound on a drum carried

by each locomotive; while one rope is being wound on the drum of one engine, the other is being unwound from the drum of the second engine.—No. of patent, 11,077; price 7s. 6d.

The patent granted to Sir James Caleb Anderson, June 29, 1846, claims a "plough anchor" to be used in steam cultivation. This is to be fixed in the ground a considerable distance from, and in advance of, the locomotive engine which drags the tilling implements. To this fore anchor one end of a rope is attached, which is wound upon a drum carried by the engine; the other end of the rope is unwound from another part of the drum, and is attached to a second anchor placed behind the engine. As the engine warps itself towards the fore anchor, winding round the rope on one drum, the other rope attached to the hind anchor is unwound from the other drum. On the steam and plough carriage reaching the fore anchor, it is raised out of the ground; and the action of the engine being reversed, it is warped towards the "hind," which now becomes the "fore anchor," the "fore anchor" being carried forward.—No. of patent, 11,273; price 1s. 4d.

The patent granted to John Tulloch Osborn, July 23, 1846, contains some claims worthy of notice. The first of these is as follows: Two sets of temporary rails are laid down in the fields at right angles to the direction in which the furrows are to run, the distance between the two sets of rails being from 1 to 200 yards. On these rails two locomotive engines travel, each engine carrying two drums, these being placed on the side of the engine nearest the other engine. To these drums chains or ropes are attached, and connected with two four-wheeled carriages, which carry the ploughs: these carriages, by the action of the drums, are dragged across the field simultaneously in opposite directions, each carriage pulling after it the rope by which it is to be dragged back again in its return journey. By this arrangement, while one drum is hauling in a carriage, the other drum is paying out its rope or chain for the return traverse. When one traverse of the ploughs is completed, the engines are moved along the lines of rails by means of a chain attached at one end to an anchor laid out ahead, and the other end of which is wound round a drum connected with the crank-shaft of the engine.—No. of the patent, 11,304; price 1s. 2d.

The patent granted to James Boydell, August 29, 1846, is for the well-known "endless railway." The invention consists of "a mode of applying movable detached parts of a railway to the wheels of carriages, whereby each part is successively placed by its wheel on the road or land over which the carriage has to pass; each piece of the railway, when down, allowing its wheel to roll over it; and the wheel lifts the pieces of the railway successively, and holds each piece in such position as to deposit it correctly when that part of the wheel which carries a part of the railway again comes near the earth; by which means a railway will be continuously

formed and broken up as the carriage is drawn along on a road or over lands, by which the power required to draw a given load will be reduced."—No. of the patent, 11,337 ; price 6d.

In the patent granted October 14, 1847, to Sir John Scott Lillie, the apparatus for steam-tilling is described as follows: The plough or implement carriage has two sets of wheels placed at right angles to each other, one set supporting the carriage while the implements are in action, the other set—which are capable of being raised or lowered—being employed to shift the carriage *sideways*, when it is desired to operate upon a new portion of the field. The carriage supports two " square stave or skeleton drums," over which passes an endless railway of wooden planks or wrought-iron plates hinged together so as to turn freely over the drums, and circulate round the bearing-wheels of the machine, which travels thereon. A high-pressure steam-engine is proposed to be carried by the frame, for impelling the machine by a " whelp wheel," drawing in a rope passed round, and kept tight by a grapnel on each side of the field. In cases where the weight of the engine will be too great for the state of the land, as in boggy or marshy soils, the plough or implement carriage is proposed to be dragged alternately in different directions across the field by the power of two engines, running on rails placed at the headlands. Or one engine may be used, an *endless* rope passing round the engine drum or whelp at one side of the field, and round a pulley carried by a platform mounted on wheels at the other side.—No. of patent, 11,907; price 1s. 2½d.

The machine patented by P. H. C. Barrat (November 25, 1847) is of that class of cultivating machines which move over the land at the same time that they work the tilling or cultivating implements. The principal novelty in the machine now under notice is the " arrangement of one or two rows of teeth, to which, on the one hand, a rotary alternative motion is given; and on the other hand, a to-and-fro movement, in such manner as to imitate as much as possible the work of the hand with a mattock, whereby the earth is returned to the ground after it is raised." The machine consists of a steam-engine supported on four broad wheels, to the hinder end of which the frame containing the mattocks is fixed. Each mattock is provided with a two-forked or curved tined head, and is fixed at the other end to a revolving shaft. One half of the mattocks are of shorter length than the others, and fixed in the shaft alternately, so that while the first row of short mattocks enter the soil, and penetrate it to a depth of from 7 to 9 inches, the second row of long mattocks come up and penetrate the soil to a greater depth. The shaft carrying the mattocks has two motions, one an alternate-circular, the other a to-and-fro motion, thus imitating the manual operation of digging, as above described.—No. of the patent, 11,977; price 2s. 5d.

The patent granted July 18, 1849, to James Usher, is for the well-known travelling rotatory cultivating machine. The patent has two claims, one for mounting a series of curved ploughs in the same plane round an axis, and the other for giving rotatory motion to the ploughs in such a manner that the "resistance of the earth, as the ploughs or other instruments enter and travel through it, shall cause the machine to move onward. The ploughs—so called —are attached to a shaft drawn by gearing from the engine. The shaft carries a series of plates parallel to, and at equal distances from, each other; to each plate three curved ploughs are fixed, these being suitable for penetrating the soil in the opposite direction to that in which the machine is advancing, and for elevating and turning over portions thereof. "Not only do the ploughs which are set in the same plane follow each other into action, but the several sets are so arranged with relation to each other, that two ploughshares will not strike the earth at the same instant." This method of propelling the machine over the land by the resistance of the earth to the action of the ploughs, is stated by the inventor to "act better than machines in which tines or teeth round an axis have had motion communicated to them from the wheels which run on the land."—No. of patent, 12,710; price 9d.

To G. Galloway and R. A. Parkin a patent was granted, November 24, 1849, for an invention applicable to ploughing land by steam power. The steam-carriage employed has connected with its hind end a large frame, carrying at its top a set of three pulleys keyed on to a horizontal shaft, and at the bottom, on each side of the frame, a similar set. The three sets of pulleys are so placed relatively to each other, that an endless compound chain passing over them forms an equilateral triangle. To this chain, at equal distances apart, nine ploughs are attached longitudinally, and in such positions transversely to the chain that they stand in three parallel lines, "the 1st, 4th, and 7th ploughs being farthest from the carriage, the 2d, 5th, and 8th in the middle of the chain, and the 3d, 6th, and 9th on the side nearest to the carriage. When the chain is caused to travel round the pulleys by the power of the engine, the several ploughs of the three sets successively come into action, forming three parallel furrows while passing between the two lower sets of pulleys; and as the machine at the same time moves slowly onward, the furrows are produced in a diagonal line across the field."—No. of patent, 12,860; price 10d.

The patent granted July 3, 1850, to P. R. Hodge, is for a "steam digging-machine." The frame is mounted on four wheels, and supports a movable or traversing platform, which carries the spades and their appendages, with the steam-engine which works the same. The helves or handles of the spades are connected by rods with a crank-shaft, from which motion is communicated to a "tipping shaft," which is placed under the lower part of the

handles of the spades, and provided with four cams. The ob of these cams is to allow the spades to be forced into the earth the connecting-rods of the crank-shaft to which they are attach and to be drawn up again with the sod upon them, till the conne ing-rods reach the vertical position; at which point the cams stri against the handles, and jerk off the sod. The upper part of t helve of each spade is solid, and is passed into a tube in which helical spring is fixed: this spring is of such power as to resist t greatest amount of force required to make the spades penetrate t soil, but so as to yield whenever the spades come against any o struction likely to damage them.—No. of patent, 13,159; pri 2s. 1d.

The patent granted August 12, 1850, to George Thompson, also for a digging-machine. It travels upon two wheels, but considerable portion of the weight is supported by two rolle placed behind. Two horizontal crank-shafts extend across th machine, and have connected with them, by their upper ends, tw rows of spades. The shafts receive motion from gearing actuate by the running-wheels. The lower part of the stem of each spad is formed with a circular opening to receive a small spindle; upo the ends of this, guide-wheels are fixed, which work in guide-fram suspended from the crank-shaft. "As the upper end of the stoc accompanies the crank-shaft in its rotation, the spindle ascends an descends in the guide-frames, serving as a shifting fulcrum o axis on which the stock turns or oscillates; and the spade thereby caused to dig or scoop out a portion of earth, and deliv it into a vibrating box, by which it is turned over and deposite upon the land."—No. of the patent, 13,222; price 1s. 1d.

A digging-machine is also the subject of a patent granted t George Guthrie, March 24, 1851. The carriage is mounted o four broad wheels, to enable it to pass easily over the land. series of graips, spades, or forks are placed at the back of th machine, and are caused to enter the earth successively throug the intervention of cranks actuated by proper gearing. Th spades have a motion given to them approximating to that of th ordinary spade on digging by hand, so as to raise the soil, whi is then lifted up so as to bring it nearly into a horizontal positio when the spades have a semi-revolution on their axes given them, so as to throw off the earth. As these operations procee the machine is advancing at a slow rate, so as to bring up ne soil to the action of the spades.—No. of patent, 13,564; price 10

In the cultivating machine patented by D. S. Brown (pate dated September 25, 1851), a series of cutters or blades, havi rapid rotation given to them, enter, break up, and pulverise t soil. The frame of the machine travels on three wheels, a carries two rows of spindles—one row being near the middle the machine, the other at the hinder end. The spindles are plac

at an angle, so that their lower ends—furnished with the cutters or blades—are near the earth. The upper ends of the spindles are provided with bevil-wheels gearing with the other wheels, deriving motion from the prime mover. The spindles work in jointed bearings, so that any one, or all of them, can be lifted up out of contact with the soil as desired.—No. of patent, 13,757; price 8d.

John H. Pape, in his patent dated October 23, 1851, describes a novel mode of using steam power to impel a plough. To the frame of the plough a large hollow cylinder, with hollow axle, is connected. The cylinder has a flange at each end, and rolls over the ground as it proceeds. The hollow axle supports a steam-boiler and fire-grate within the cylinder; the smoke passes through the hollow axle into the atmosphere, while the steam passes through the valve of an ordinary steam-cylinder suspended from the other end of the axle. "The piston-rod projects downward from the cylinder, and is furnished at its lower end with a foot or claw, so that, when the piston is forced downward by the action of the steam, the foot or claw will take hold of the ground and impel the plough, the large cylinder at the same time rolling onward. After each down-stroke the piston is raised again by a spring."—No. of patent, 13,786; price 9d.

The digging-machine patented by Martyn John Roberts, January 31, 1852, presents a peculiar arrangement of mechanism, in action similar to that of "Morgan's feathering paddle-wheel, where the floats may be said to resemble the tines, with this difference, that in my digging-machine, though I cause the tines to enter the earth with as little effort as possible, as does the paddle-wheel in the water, yet, in the paddle-wheel, the object is to have as little back-water as may be; whereas, in my digging-machine, I endeavour," says the patentee, "to obtain as much earth thrown up as possible." Two parallel discs, fixed together by a small horizontal tube, have a series of holes made in each, in the form of a circle, near their outer edge. Through these holes a series of rocking-shafts, which carry the tines, are placed. The end of each rocking-shaft is provided with a crank, connected by a small connecting-rod to a cranked axle, which extends through the hollow axle on which the discs are fixed. As the machine progresses, the tines penetrate the earth, the discs turning round bring each set of tines in succession into operation; a rocking motion is at the same time given to the shafts by their connection with the cranked axle. The object of the two motions thus given to the tines—a circular and a lateral—is to cause them to "enter the earth with the least possible effort, and to leave it in the best position to carry up earth with them." The tines are cleaned by passing between a series of curved bars, and fixed eccentrically to the course of the tines.—No. of the patent, 13,943; price 1s. 3d.

The patent granted to William Pidding, March 24, 1852, has reference to a mode of applying "portable railways to carriages used for the purposes of ploughing or harrowing," &c. &c. The patent of the above date (No. 14,036, price 9d.) is for certain improvements in the method patented in a preceding patent—dated November 21, 1846 (No. 11,460, price 11d.), and to which we now refer. To the under-side of the carriage a long horizontal frame is attached, the sides of which are parallel, but the ends semicircular. A series of rollers move round this frame, the axes of which are connected by links, thus forming an endless chain encircling the frame. At right angles to each link a small wheel is fixed. The office of these wheels is to keep the rollers at a distance from the ground. As the frame is drawn forward, it rolls "over the lower rollers, while the lower wheels remain stationary upon the ground, until, by the movement of the endless chain produced by the advance of the frame, the hindermost wheel is lifted from the earth, and another wheel is brought down to the earth at the front end of the frame." Under the last patent (No. 14,036), 1852, the improvement on this method now described is, in making each plate or link with a semi-cylindrical rib to fit into a recess in the "shoe" or chair, and connecting the latter with the plate by springs at each side. The endless band of rollers, also described above, are, in the second patent, proposed to travel upon a perfectly circular rail, which rolls along the ground, and which is kept in a vertical position by a large frame, fitted with friction-rollers in such a manner that the circular rail works freely between the rollers. The circular rail here referred to is made of rings of gutta-percha or india-rubber and pliable rings of metal, placed alternately. To the elastic material it is proposed to apply heat when "off the ground, and cold to the metal; so that when it comes in contact with the gutta-percha, &c., which it will do when the endless chain of anti-friction rollers run over the gutta-percha and metal, the latter will convey or communicate its cold to the former, and make it sufficiently rigid to bear a considerable weight without bending."

We have now presented an abstract of the principal patents connected with "steam-culture" taken out under the old Act. We propose, at a future period—possibly our next Number—to give a similar abstract of those taken out under the Patent Law Amendment Act of 1852.

THE FARMERS' NOTE-BOOK.—NO. LXII.

Experiments with Special Manures on Turnips.—No stronger proof can be given of the altered circumstances of farming than the number of substances and compositions now used as manures, which were quite unknown a few years ago. No better evidence can be adduced of the importance and extent of the interests connected with agriculture than the number of people employed in the collection, manufacture, and sale of these manures, and the greatness of the means used for transporting them by sea and land. Nothing can be more interesting and profitable to the farmer than testing their value by well-conducted experiments in the field; and no greater check can be placed on the unprincipled manufacturer of them than the publication of these experiments. Since this is the case, it is proper that the farmer should be most careful in the conducting of the experiments, and most wary in the purchase of the manures. Manufacturers and agents are generally most anxious to have their manures tested by farmers, and are often willing to give a considerable quantity free of all expense, on condition of experiments being performed with it. Now we have no great confidence in an experiment with manures sent specially to be tested by comparison with others. We have often seen such substances produce a first-rate crop when sent in small quantity for the purpose of being experimented with, but fail afterwards when purchased in large quantities. The discordant results produced by such manures as the "Economical Manure" *par excellence,* lead us to suspect that they vary much in composition. There is nothing connected with this subject so puzzling as the hundred and one testimonials (we believe we should say the thousand and one) in favour of this manure. If the material sent (its composition gives it no title to the name of a manure) to those who have testified in its favour, be similar to what has been delivered to the hundreds or thousands whose crops have derived no benefit at all from it, then is there something peculiar in the soil on which it has proved beneficial;—yea, we go farther: if what has produced the favourable results testified is similar in composition to that which has been analysed, then is all that chemists and vegetable physiologists have told us of the composition and growth of plants a tissue of errors.

In conducting the experiments, a great many things should be attended to, in order to produce accurate results, such as the previous treatment of the soil and its composition, though this is both difficult and expensive—for the composition of the subsoil would have to be noted. Several experiments with the same substances should be performed in the same field, or at all events in the same farm, in different quantities. This is most important, as we shall shortly see, but is very seldom attended to. It is

thus that often an inferior manure will produce as good a result as a very superior one, if applied in equal quantities. There is a limit to the productive powers of all manures; whenever that limit is reached—whatever additional quantity of the same manure is applied—will do no more good, but probably evil. A superior manure will of course require a smaller quantity to arrive at this limit than an inferior one: if we add more of the former it will have no good effect, at least on that crop, whereas more of the latter will increase the results till its limits be reached. If, for instance, we suppose the productive limit of a good manure to be an application of 3 cwt. per acre, and that of an inferior one to be 6 cwt.—that is to say, if we suppose it will require 3 cwt. of the one and 6 cwt. of the latter to produce the largest and equal results which it is possible for them to produce on a particular field, and if 6 cwt. of each were indiscriminately applied, it is clear that, in point of expense, the inferior manure would be considered the best. Hence the value of any manure should be determined by the most profitable results derived from its minimum application. Hence also the necessity of regulating the quantities of different manures in soils of various conditions. Generally speaking, soils in low condition are best adapted for experiments—it being sufficient for the purpose if they contain all the elements, though in small quantity, necessary for the growth of a plant.

We have observed with pleasure reports of experiments with different manures in various agricultural journals. Now, while we consider these most useful to farmers, we consider them merely indications of what are the best manures—for every one must experiment for himself, and use what is found most suitable for his own farm. Perhaps the expression of this opinion is unnecessary here; for, after a perusal of the reports which appear ever and anon, the farmer will become quite bewildered, and we are sure will just resolve to try for himself. Though there is this uncertainty as to the value of most of the manures, there are some which deserve honourable mention here as producing larger crops more frequently than others. Of these we may mention Peruvian guano first, and then Phospho-Peruvian, Procter & Ryland's turnip manure, Odam's Blood manure, and some superphosphates. We remark it as somewhat curious, that equal values of Patagonian and Peruvian manures produced equal crops, and an equal value of a mixture of the two produced 3 tons 7 cwt. more; and while 45s. worth of dissolved bones alone produced only 19 and 20 tons and some odd cwt., 22s. 6d. worth of the same bones, mixed with 22s. 6d. worth of Peruvian guano, raised upwards of 25 tons. This shows the advantage of mixing different manures—a practice apparently but little followed by farmers who experiment with different kinds. We have long found that we can

grow a larger crop of turnips at less cost by mixing Peruvian with some of the inferior phosphatic guanos than by using it by itself. In another experiment the curious fact is brought out, that calcined bones produced nearly as large a crop as an equal value of Peruvian guano, and that, too, on a field on which calcined bones had been applied to the previous oat crop, to which was attributed the large crop which grew on a part of the same field on which no manure whatever had been applied—a crop equal to a full average grown in the Lothians by the aid of manure. And if we calculate the cost of a crop of turnips raised by the manures applied to such a soil—we mean the surplus crop over and above what is due to the productive power of the unmanured soil—we find that it will amount to from 6s. to nearly 9s. per ton, as may be seen by studying the report of experiments by Mr Ewart, Borgue House, by Kirkcudbright, as published in the *North British Agriculturist.* Again, in estimating the value of a manure, we should always take into account its unexhausted virtue for the succeeding crops.

Our object in performing the following experiments was to ascertain the effect of mixing guano with sulphuretted carbon, manufactured in Carlisle, of the advantage of which we had heard, and also to observe the effect of M'Dougal's disinfecting powder on the manurial value of ordinary farmyard manure; we were also anxious to obtain some information regarding the most profitable quantity of guano to apply to an acre. To enable us to arrive at what we desired, we selected a field naturally poor and not in the highest condition.

	tons.	cwt.	qrs.
20 tons of farmyard manure gave	18	16	1
20 do. do. with 6¼ stones of M'Dougal's powder, at a cost of 8s., gave	19	19	1
4 cwt. of Peruvian guano, and 4 cwt. of sulphuretted carbon, at £4, ...	20	10	0
20 cwt. of sulphuretted carbon, at £6, 10s., ...	11	6	3
8 cwt. of Peruvian guano, at £5, 8s., ...	20	13	2
8 cwt. of Peruvian guano and 2 cwt. of M'Dougal's powder, at £6, 8s., ...	19	10	3
10 cwt. of Peruvian guano, at £6, 15s., ...	19	18	0
8 cwt. concentrated manure from Carlisle, at £4, 4s., . .	18	7	0
3 cwt. Peruvian guano and 4 cwt. of a superphosphate, at £3, 19s. 10d., ...	17	4	4

The farmyard manure was driven to the field two months before being used, and thrown up into two heaps and covered with earth —the powder being mixed with one of the heaps during the process of throwing up. The most profitable of the applications used is that of the guano and the sulphuretted carbon—the result agreeing with the report we heard, that a mixture made up of equal weights of it and guano would be a more profitable application than if the same weight of guano as the mixture had been applied. By a mistake, too much of M'Dougal's powder was mixed with the

guano, and hence, we believe, a smaller crop. We believe that a larger crop would have been obtained if we had only used ½ cwt. instead of 2 cwt. of the mixture. It is worthy of remark that 10 cwt. of guano did not produce as large a crop as 8 cwt. We are of opinion that, as an experiment, we should have used smaller quantities of guano; but the field being in comparatively low condition, we did not think it advisable. It would have made the experiments, however, far more conclusive if we had applied 5, 6, and 7 cwt. to test the true value of the mixture of it and the salphuretted carbon, and also the efficacy of guano from its minimum application.

In another field the following experiment was tried, to test the Phospho-Peruvian guano with good Peruvian:—

	tons.	cwt.
5 cwt. of Phospho-Peruvian per acre, at 60s., produced . .	20	3¼
5 cwt. of Peruvian per acre, at 67s. 6d., produced . .	21	7¼

We performed this experiment at the request of the Messrs George Seagravé & Co., of Liverpool, who were anxious that equal weights of the two varieties should be tested. We have thus raised a cheaper ton of turnips by means of the Phospho-Peruvian, though we have no doubt that we would have obtained a much larger crop, at a lower cost, had a mixture of the two been applied.

*The Purification of Rivers, and the beneficial Application of the Sewer-water of Towns.**—This is a new pamphlet on an old subject; another addition to the many contributions to the literature of a subject it has often been our province to discuss. The present system of disposing of our town-sewage is productive of two evils—first, the waste of a material which, however much opinion may vary as to its real value, is certainly worth something, and should not therefore be heedlessly wasted; and, second, the bringing of our rivers into something like the condition of open sewers, with all their concomitant evils. It is to obviate this double evil, in connection with the Clyde, that the plan of Mr Pollok, discussed in the Letter now before us, has special reference; the principle involved, however, is obviously applicable to other localities.

Mr Pollok's plan is of two parts—first, the arresting of the sewer-water before it enters the river; and, second, the mode of application. Taking the range of sewers, he divides them in such a way that one set are made to discharge into a tank, taking off the sewer-water of the north district of the city; another set discharging eastwards into a second tank; a third set discharging north-westward into a third tank; the fourth set discharging

* *A Letter addressed to the Right Honourable the Earl of Derby.* By Morris Pollok, of Govan Factory, near Glasgow. The profits, if any, to be given to the Eye Infirmary and the Royal Infirmary of Glasgow. Glasgow: John Smith & Son.

north-eastwards into a fourth tank; the fifth and last range discharging northwardly into a fifth tank—the connection between each range being cut off. The tanks proposed are to be divided into two equal parts by a wall—"the end of this wall farthest from the main sewer to terminate in a semicircle, so constructed that into the chamber thereby formed water may be admitted from either division at 3 feet from the bottom, and excluded from the other; the end of the main sewer to be so made that it may discharge its contents into either half of the reservoir that may be wanted." A square tower is to be built on either side of the reservoir opposite the point of discharge, supporting at top a cistern, into which the liquid sewage is to be pumped by the power of a steam-engine placed in the lower story of the tower. The contents of the semicircular chamber only are to be pumped up. This chamber admitting the sewage only when 3 feet deep in the tank, the sludge must collect to the depth of 3 feet in that division before it can be pumped up. When the sludge accumulates to this depth, thus incurring the risk of its being pumped up into the town cistern, the contents of the main sewer are turned into the other division of the tank, while the sludge is removed from the other division. The liquid portion of the sewage is thus proposed to be used only—Mr Pollok being of opinion that, even as sent out, it will still be too strong to be applied to the land without the addition of water. What is to be done with the gradually-increasing stock of sludge Mr Pollok does not say.

As to the mode of application. The sewage is led from the tower-cistern by a pipe, which is taken downwards, and continued underground to any locality where it is considered desirable to use it. In applying it to the land, the following is Mr Pollok's plan: Parallel to the drain, and 6 feet from it—supposing the drains to be 18 feet apart—a deep furrow is to be run with a double mould-board plough; other two furrows, each 3 feet from each other and this first furrow, are to be run also. Into these furrows the sewage is to be run from a water-cart, which is to be followed by an apparatus to turn over the earth upon the sewer-water, covering it up, preventing all effluvia arising, and preserving all its valuable properties. "Every atom, then," says Mr Pollok, "fit for the food of plants, will be absorbed by the earth until saturated, and nothing will pass into the drains but pure water." The liquid sewage thus used up is proposed to be stored up in water-tight wells, placed at convenient parts of the farm. These wells receive their supply from the main pipe—leading from the tower-cistern—by means of branch pipes. As it may not be advantageous to use the sewage at all seasons of the year in cultivated farms, Mr Pollok proposes to make the termination of the main pipes near to some moor, or other unreclaimed land, to which the sewage may be applied at all times, as above described.

The pamphlet addressing a reader or readers supposed to be ignorant of, or at least not thoroughly up in all the bearings of the "utilisation of sewage," Mr Pollok goes somewhat fully into the value, in a natural and economical point of view, of the application of the sewage to the land. On the latter point Mr Chadwick is the principal authority referred to. Our readers, knowing how this gentleman's opinions are controverted, and the claims of other authorities to be heard in evidence who possess equal standing and experience, will agree with us in thinking that it would have been better had a wider range of authorities been quoted. As a contribution to the discussion of the question which every day, whether viewed in its agricultural or sanitary aspect, bulks more and more largely in public opinion, the pamphlet, even with this fault—if fault it is—is calculated to do good.

The latter part of the pamphlet, so far as our purposes are concerned—for there is other matter contained in it *—is taken up with a statement of the cost of carrying out the plan proposed. Into this we have not space to go farther than to give the following extract, which, after all, contains the gist of the matter, so far as our readers are concerned :—" 3s. 9d. per acre will compensate to the landlord his outlay of capital; and this, with 1¼d. per ton of sewer-water used by the farmer, is all the farmer will have to pay for this manure brought to his very door."

AGRICULTURAL SUMMARY FOR THE QUARTER.

THE last quarter, in point of weather, has been rather exceptional. The fine weather we had in the end of September was succeeded by a week or two of heavy rains, which soaked the land, and impeded for a time all operations on it. Some were fortunate in getting all their potatoes lifted before the rain commenced, but most farmers had, if not all, the greater part of that crop to secure, when they were interrupted by the heavy and almost constant rains. There is no doubt that those potatoes which had not been lifted were considerably affected by the disease during the wet weather; and when they were driven to the pits from fields where the soil was of a clayey description, the quantity of damp earth adhering to them, put them in anything but a favourable state for preservation. The consequence is, that in many parts of the country the loss from disease in the pits has been most serious, and in some districts there is scarcely one really sound potato, as after they are peeled the tuber is found spotted all over with dark-coloured specks. This, though it injures the sale of them when it is known, does not

* An extract from an *Essay on the Financial Situation of Great Britain*, and an Appendix to this Essay, take up the remainder of the pamphlet.

render them useless for human food. The wet weather continued during almost the whole of October, the 10th of which was rendered memorable by as large a flood of the waters as took place in July. The month of November was distinguished for a very severe frost for some days about the 20th, and also for the utter extreme of pleasant mildness of weather immediately before and after the frost. On the 21st, the lowest temperature during the month was observed at Aberdeen, when the thermometer stood at 16°, which was little below what was observed in many other places in Scotland. The mean temperature of the month was 5° below that of November last year, and the mean monthly range has been 32° 3′. The rain which fell was considerably less than at the same time last year. In December there have been alternations of frost and fresh, with stormy blasts and rain, though the fall of the latter has certainly been below an average.

From the description of the weather given above, it will be seen that, upon the whole, it was favourable for agricultural operations; for with the exception of the very wet weather we had in October, and the frost in November, there was nothing to prevent the working of the plough. That operation, therefore, has been pushed vigorously forward, and we never recollect of its being in a more advanced state at this season of the year. The beginning of November being most favourable for the sowing of wheat, a considerable breadth of land, from much of which turnips were lifted, was laid under this valuable cereal, so that we have now our full average quantity of land in wheat; but we seldom remember of seeing so many fields sown with it, and not brairded. This arose very much from the wet weather in October preventing the sowing of a great deal of land intended for wheat, and that during the first three weeks in November inducing many to sow it where at one time they never intended. The consequence was, that an unusual number of fields was sown immediately before the severe frost, which set in about the 20th of November. The turnips, where good, have been extensively stored in fine condition. The great failure of this crop, which has taken place in some districts, has induced many, who have been more highly favoured, to economise it as much as possible, so as to take advantage of the high price likely to be obtained for it in the large towns which used to be supplied by the farmers in those districts where the failure has taken place. We fear much that, on account of so many trusting to obtaining the high price consequent on the failure, there will be some disappointment, as the market will probably be glutted with the article. We observe that many farmers have availed themselves of the early harvest, and the dry weather in November, to clean much of the land intended for the turnip crop by means of the grubber. Where the soil and weather are suitable for this operation, it is of great advantage both for furthering and economising

the labour in spring. The weeds are attacked when their roots have least hold of the ground, and their connection with the soil is thus easily severed; whereas, if they were allowed to remain in the soil during winter, new shoots would be thrown out before the cleaning operations would be commenced, and a firmer hold of the soil would be taken by the roots, the separation of which would be attended with a considerable expenditure of labour.

The prices of grain at present are anything but encouraging to the arable farmer. The abundant crop and the reduced consumption, as well as the large importations, are the cause of that apathy so prevalent in all our markets. Upon the whole, now the grain brought to market is in very good condition; but immediately after harvest it was flooded with an immense quantity of barley and oats, which had been spoiled in the stack by overheating from being led too soon. This was particularly the case in all the best and earliest districts, such as East Lothian, Roxburghshire, &c. Many farmers, from want of caution and due attention in harvest, have thus lost a considerable sum of money, at a time when, from the low prices, it is found necessary to make the most of all their produce. The position of the farmer at present is not the most hopeful; for though there is little difference in the price of his grain now from what it was in 1850, there has been an immense rise in everything that he has to purchase, such as labour and manure. It is reckoned that the labour on a farm is now fully 6s. per imperial acre more than it was in 1850; while guano, which may be reckoned the standard of value of the light manures, is selling at about £3 per ton more now than it did then. Fat cattle and sheep still maintain a good price in the market, and help in some measure to make up the deficiency which is caused by the low price of grain. We regret, however, to hear that pleuro-pneumonia has been raging in some districts with great virulence, and that there have been an unusual number of deaths this season of sheep on turnips. This will tend materially to reduce the profits of feeding, if it has been general.

Stomach-Staggers.—A very interesting lecture was delivered at the last monthly meeting of the Highland Society by Professor Dick. At particular seasons of the year, horses, cattle, and sheep become affected with this disease, producing sometimes a paralysis [illegible] hind quarters and extreme dulness, with apparent blindness, [illegible] walks forward, coming into collision with any object that may be in its way, such as the walls of the loose-box [illegible] which it may be placed, or the fences, if it is in a field. The disease occurs among animals generally in the months of June, July, August, and September, when the ryegrass seed has become [illegible]e, and the stalks are hard, and there is little succulent food, and [illegible] supposed to [illegible] by [illegible] mass of indigestible dry matter [illegible] arises from a gorging of

the stomach with too much nourishing food. This is particularly the case with cattle in spring, newly put out from the cattle-courts to luxuriant young grass-fields. As a preventive in such instances, it is always advisable to take a little blood from the animals before they are put to grass, if they are in good condition. The Professor mentioned, that since the practice of dividing the evening meal to the horses during winter—that is, giving some immediately after coming in from the yoke, and the rest at eight o'clock, instead of it all at eight o'clock, as formerly—the disease has become less prevalent among farm-horses. Mr Brydon, Traquair, gave his experience of the disease among hoggs, advising great caution in putting this class of sheep on the withered dry grass in the end of summer. He has observed the sheep biting off the heads, the ryegrass then quite ripe; and on a *post-mortem* examination of those which had died from this disease, has found the stomach clogged with pieces of the top of ryegrass upwards of 2 inches in length. Altogether the meeting was a most instructive and useful one for farmers, who must feel much indebted to Professor Dick and the other speakers for bringing the subject before them in the manner in which they did.*

Fat Shows.—We have on former occasions remarked on the indifference which is manifested in Scotland about the shows of fat stock. The Highland Society, after two attempts, gave up the fat exhibitions as losing concerns. The Glasgow Society then tried them, and has this year discontinued the holding of one. The want of success arose, not from a deficiency either in the number or quality of the animals exhibited, but from a want of interest on the part of the public. This season, then, we have had no exhibition of fat stock in Scotland. How different is the case in both England and Ireland! Birmingham and the Smithfield Club have had their magnificent displays this year, more successful than ever, both in the objects exhibited and the overwhelming crowds which repaired to the respective places to witness them. So important and extensive has the Smithfield Club Show become, and so popular as a place of resort, that the extensive premises in which it has been held for years are now far too small to accommodate the crowds which swarm to it the few days it is open. This year, examination of the animals was never attempted by many who had gone there for nothing else, as they gave it up as a hopeless task even to try and get near some of the prize animals. The show of implements here is superior to anything of the kind ever held under the auspices of our national Agricultural Society—the Highland Society. In Dublin was held this year, too, a most successful show of fat cattle, sheep, swine, poultry, implements, and agricultural produce—the first ever attempted by the Royal Dublin Society. This show was distinguished by an unprecedentedly large number

* Professor Dick's lecture, and Mr Brydon's observations, appear in the present number of the *Transactions*.

of prizes being carried off by our enterprising countryman, Mr Allan Pollock. From the reports we have seen of the show, the stock exhibited by this gentleman, and indeed by many others who competed against him, would have done credit to either Birmingham or London. And it is certainly to be regretted that none of the magnificent animals exhibited in Dublin were sent over to grace the show in Baker Street, and compete for the premiums specially offered by the Smithfield Club for the first time for cattle fed in Ireland. It was certainly a happy day for Ireland, when Mr Pollock first thought of transporting his capital, skill, and enterprise to its soil. We wish him all success in his gigantic undertakings, of which he has proved himself well worthy. Are we to have a fat show in Scotland in 1859? Let feeders answer this question by at once commencing a subscription for the purpose, and we have no doubt that they will be heartily supported by the Highland Society.

National Association for the Promotion of Social Science.—We have much pleasure in directing attention to this young but vigorous Association: despising the slow and ordinary stages of growth, it has sprung into all the strength and maturity of manhood at once. We were inclined at first to give credit to its members for being talkers merely; but recent circumstances have convinced us, that though this charge may be brought against some of its members, there are others of them who are earnest workers as well. Many social and moral evils have been brought to light, and practicable remedies proposed for them. There is not, strictly speaking, an agricultural section; but some subjects were brought forward which have a very close connection with it, of which we may mention Hiring-Fairs, National Education, the Scotch Poor-Laws, and the Bothy System. The first of these was ably treated by Mr Noah Stephenson, and excited so much interest among the members that Mr Stephenson was requested to publish his paper in a separate form; and as we expect to see it shortly before the public, we hope upon another occasion to enter more fully on this subject. A blow was aimed at our parochial schools by Mr Duncan M'Laren and Dr Begg, who wished to appropriate the funds at present paid by the heri[illegible]s for parochial education to some great national scheme void of [illegible]igion. We are glad to know, however, that they were a little [illegible]ggered by an objection started by a gentleman who frequently [illegible] with them on social and political questions. The objector [illegible] upon these gentlemen to show upon what ground they [illegible]d demand these funds to be given up by the heritors for any [illegible] system whether they approved of it or not. Could they [illegible] act of Parliament compelling the heritors to assess [illegible]selves for the purposes of education, on condition of having [illegible] property [illegible] over to them for this purpose? Can [illegible] for the support of

the parish schools were other than a voluntary assessment on their part? And if voluntary, how can they ask them to be given up to support any system of which they may approve, but of which the heritors disapprove? The next two subjects—viz. the Poor-Law and the Bothy System—being both hobbies of Dr Begg, were ridden very hard by him. We regret that the precious time of this useful Association should be taken up, and its objects perverted, by such papers as those of Dr Begg's on these two subjects, which were but a flimsy veil for an attack upon the landlords and Established clergy of Scotland. He advocated the superiority of the English and Irish poor-laws to that of Scotland, because the latter contains no provision for the able-bodied poor, while the former do; which provision, he says, is "the most effectual method of compelling the proprietors to look into the causes of pauperism, and seek to remove them—a branch of study which the Scotch landlords have most sedulously shunned." And then, with strange inconsistency, he tells the meeting that "the effectual way to strike at the root of our growing pauperism" is to introduce into Scotland the Encumbered Estates Court, as was done in Ireland, so that the land might pass into "the hands of men of capital, and *the people be employed;*" and this in the same breath in which he laments that there is no provision for the *able-bodied* poor in the Scotch poor-law. We are happy to say that there are no poor on the pauper-roll of Scotland who can work, and to whom the fullest employment of every one of our labouring population can be of the slightest advantage. We agree with Dr Begg in much that he says on the bothy system, to which attention in this Journal has been frequently directed; but we certainly complain of his enlisting the sympathy of the members of the Association, by describing a state of things as they once were, not as they now exist. It is well known that of late years there has been very great improvement both in the cottages of the farm-servants and in the bothies, and both landlords and tenants were doing much to make their servants comfortable, by erecting suitable dwellings for them, long before Dr Begg began his agitation on this subject. His opinions on the bothy system are so frequently before the public of Scotland, and are now so well known, that we need not allude to them farther here.

The Allotment System.—Closely connected with the subjects of the poor-law and the bothy system is that of allotments, which was most ably discussed at a meeting of the Central Farmers' Club held in London last November. All the speakers were agreed as to the great advantage of alloting a piece of land to the labourer for being cultivated by himself, and all were also at one that the size of the portion should not be more than ¼ or ⅛ of an acre, and at a fair and reasonable rent. The size is a most important point in allotments, as upon it depends the success of the system. If more land is given than the labourer can well cultivate at his leisure

[redacted]

hours, the system will be attended with great evil, as the results will be the same as giving a farmer too large a holding for his capital—both the man and the farm will be ruined. And some benevolent proprietors, imagining that they confer a benefit on their labourers by giving 2 or 3 acres for occupation, have found out to their sad experience that they "turn a good labourer into a bad farmer." It was related by one of the speakers at the meeting that "a noble personage, known to be an eminently charitable and humane man, did on one occasion comply with the wishes of his labourers, and allow them to occupy 2 or 3 acres. Some time after he went over the land and found it in a very wretched state. Meeting one of the tenants, he said, 'Your land is not in good condition; surely you cannot live upon it;' and the man frankly admitted that he could not, and that he was beaten by the quantity he had on hand." We believe that the great cause of the extensive misery, laziness, and pauperism which prevailed among the people in the Highlands, can be traced to the evil of giving them more land than they were able to cultivate aright. It is a warning to those proprietors who, feeling the inconvenience of a scarcity of labourers in particular districts, are now anxious to encourage the settling of labourers there. Let them beware of alloting too large a piece of land to the labourer, if they wish to increase his happiness, and make him a useful member of society. Mr Mechi, at the meeting, advocated the erection of cottages, to which should be attached garden-ground, for all the labourers that may be employed on the farm. This is the plan followed in the Lothians, and in most of the best arable districts in Scotland; but it must be borne in mind that the system in England is quite different, where most of the farm-labourers collect in villages, where they have not the advantage of garden-ground; and it is in such circumstances where the allotment system is found to work so admirably, and is productive of so much good.

Weights and Measures.—This subject has been engrossing the attention of both the agricultural and commercial community very much of late. It is quite clear now that, from the energy with which the agitation in favour of selling grain by weight instead of by measure is prosecuted—from the determined ground which the advocates of weights have taken up—and from the adherence of many members of Parliament to their opinions, the present system or that of selling by measure, cannot long exist. We are only afraid that legislation may be resorted to too soon, without all the interests connected with it being duly considered. The inconvenience of the present system is acknowledged now by all dealers in grain. The question has not been sufficiently agitated among agriculturists, for any decided opinion to be expressed by them as to which system is the best. We believe that those of them in the habit of frequenting stock or bulk markets, who have an oppor[illegible] grain tasted when delivered, and receive thei[illegible]

money on the spot for it, are some of them inclined to cling to the present system; while others either want the change to weight to conform to the practice they now follow of sacking their grain entirely by weight, or are quite indifferent as to which system is adopted. Those again who are in the habit of selling their grain by sample, the delivery of which is given in their absence and the money not received for some time after—a plan nearly assimilated to that practised by merchants—lean to selling by weight. It is certainly very much for the interests of farmers that the latter plan be adopted, because they of all others are more liable to suffer from the errors which arise from measuring; and as they are almost entirely sellers, they have opportunities of ascertaining the full value of their grain before selling it either privately or during the hurry of an open market. The merchants of Liverpool, Hull, Glasgow, Leith, and many other towns, have resolved henceforth to sell by a standard of weight in the face of a legislative enactment insisting on measure; and some cities on the Continent have followed their example, in discarding measure and using weight alone in grain transactions.

Law Decisions: Sale of Grain.—Mr F. Thomson, grain-dealer, Edinburgh, bought from Mr Logan, farmer, Boon, Berwickshire, two lots of barley, at 18s. and 25s. per qr., in Dalkeith market. The lot at 18s. was at Logan's farm on the day of the purchase; and 72 bags of the lot at 25s. were safely delivered, according to Thomson's directions, at the railway station, by Logan's carts, on the day of the sale, which was on a Thursday. On the Wednesday after, Thomson sent his carter to the railway station, where the grain had lain for nearly a week, to take delivery of the barley. He emptied 25 bags of it, and then stopped, alleging that the barley was not according to sample. Thomson informed Logan, the day after, that the barley was not conform to sample, when Logan offered to take it back, rather than allow Thomson to keep it at the value he then put upon it—viz. 18s.; but when Thomson mentioned that he had broken bulk, Logan refused to take any of it back. Logan's servants swore that the barley at the station was not the same barley as left their master's premises on the carts. Thomson then summoned Logan, to recover payment of £10, 8s., being the difference in value of 72 bags of barley, including railway storage. The Sheriff-Substitute, Mr Jameson, decided in favour of Thomson. This is a most important case for farmers; but as we understand that the decision has been appealed against, we forbear expressing an opinion at present.

Master and Servant.—The following case of George Valentine and Alexander Addison, farm-servants, against Mr John Smith, farmer, Haughs of Kinnaird, was brought before Mr Sheriff Ogilvy at Forfar. The case for the servants we give in Valentine's own words: "He had been driving his horses during the potato-lifting, filling his own carts, and driving in his turn from

the field to the pits. The gatherers wished extra pay for empty ing the creels into the carts. Mr Smith would not give it; and the he ordered the pursuers to empty the creels, and set boys to driv the carts between the field and the pits. He had thus to work for th common hours of the labourers; and at 'loosing' time had to take th last load to the pits; then take home his horses; feed and clean them yoke them, and go back to the field with them, to be ready to star at the hour with the gatherers. He thought he was not bound t do this, refused, and was dismissed. He was willing to work fo the remaining month of his engagement at any labourer's work o the farm, but not if his horses were taken from him, to attend t them besides." The servants were hired as ploughmen for the hal year; they claimed the wages due for the five months they ha wrought, and damages for unjust dismissal. Mr Smith's grieve an foreman both thought the order given to the men to be unjust an unreasonable, and contrary to the custom of the district; the forme thought the order so unreasonable that he asked Mr Smith to giv it himself. Two neighbouring farmers were of the same opinio and did not think it unreasonable in the men to refuse to obey suc an order. On the other hand, a Mr Evans, road-surveyor, wh had been a farm-servant for several years, and twenty-four years grieve, considered the order given by Mr Smith quite reasonabl and was accustomed to see the ploughmen empty the baske while boys were driving their horses from the field to the pits, a to attend to their horses besides, wherever he had been a servai A servant to a neighbouring farmer thought the order quite a cording to the custom of the district; and two farmers were the same opinion. The Sheriff said: "It was his impression th the strict rule of law was against the servants; but there we special circumstances which might render it harsh to give the m no wages for five months' work. Taking into account the you of the parties, the fact that no insolent or disrespectful langua had been used, and that their own grieve encouraged them in th disobedience, he gave decree in favour of the servants for the f amount of the wages sued for." So far as we have been able judge of the case, as reported, and the custom of the district, declared by the witnesses, we think the order given was qu easonable, and such a one as is daily executed by ploughm cheerfully in all parts of the country; that the conduct of Val ine and Addison was an act of insubordination, and ought to punished as such. How often, for instance, is a ploughman orde to fill or draw out manure from a cart, day after day, while horses are driven by boys from the steading to the field, and he besides to clean and feed his horses morning, noon, and night? ... necessary part of his duty, as well as performing ... state-field ... these men refused to do.

AVERAGE PRICE OF THE DIFFERENT KINDS OF GRAIN,

PER IMPERIAL QUARTER, SOLD AT THE FOLLOWING PLACES.

LONDON.

Date.	Wheat.	Barley.	Oats.	Rye.	Pease.	Beans.
1858.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Sept. 4.	48 6	37 8	31 2	36 0	47 2	41 9
11.	48 7	36 5	28 9	36 3	46 3	41 4
18.	48 0	38 2	24 7	36 2	51 8	43 11
25.	46 7	36 0	28 7	36 0	44 0	43 2
Oct. 2.	45 9	36 9	28 4	35 6	46 11	41 5
9.	45 11	36 8	27 6	34 3	48 6	46 6
16.	45 7	36 4	26 5	31 8	50 1	42 10
23.	44 6	38 11	24 9	30 6	47 11	49 10
30.	45 2	37 11	25 8	30 2	52 6	44 8
Nov. 6.	45 3	36 10	26 1	30 9	46 8	37 4
13	43 7	37 4	26 5	31 6	48 9	38 2
20.	44 0	38 9	26 6	32 0	43 11	39 1
27.	43 4	37 1	25 4	32 2	48 9	37 8

EDINBURGH.

Date.	Wheat.	Barley.	Oats.	Pease.	Beans.
1858.	s. d.	s. d.	s. d.	s. d.	s. d
Sept. 1.	45 5	31 1	27 5	48 7	49 4
8.	45 4	32 2	26 8	47 0	47 5
15.	44 7	32 6	26 5	47 2	48 1
22.	45 6	31 10	25 11	46 6	47 3
29.	40 1	30 11	24 6	45 6	46 1
Oct. 6.	45 8	31 1	23 5	45 4	46 2
13.	45 7	31 10	23 5	42 6	43 4
20.	44 9	33 5	23 9	41 6	41 11
27.	45 6	31 7	23 6	42 2	42 8
Nov. 3.	43 5	31 0	23 1	41 0	41 9
10.	42 5	30 11	22 10	39 6	40 4
17.	42 3	30 11	22 1	39 4	40 2
24.	42 1	31 2	22 3	39 6	40 5

LIVERPOOL.

Date.	Wheat.	Barley.	Oats.	Rye.	Pease.	Beans.
1858.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Sept. 4.	45 9	35 4	26 11	33 6	45 6	44 2
11.	45 2	34 8	25 7	33 8	46 4	43 6
18.	45 11	35 10	25 10	32 10	45 9	42 10
25.	44 4	36 6	26 0	32 6	44 8	43 6
Oct. 2.	43 9	34 6	26 4	33 1	44 0	46 6
9.	42 10	32 4	23 5	32 8	45 0	46 2
16.	42 0	29 10	23 9	32 2	34 8	50 0
23.	43 0	33 5	21 6	36 9	44 0	44 8
30.	41 4	33 8	22 7	30 6	40 10	45 10
Nov. 6.	42 8	33 10	24 9	30 2	42 4	46 1
13.	40 1	29 6	24 2	31 4	43 6	45 3
20.	42 0	29 5	21 9	31 6	44 10	43 0
27.	41 1	32 2	22 0	31 4	42 4	37 8

DUBLIN.

Date.	Wheat, p. barl. 20 st.	Barley p. barl. 16 st.	Bere, p. barl. 17 st.	Oats, p. barl. 14 st.	Flour, p. barl. 9 st.
1858.	s. d.	s. d.	s. d.	s. d.	s. d.
Sept. 4.	23 9	16 10	13 6	15 0	16 6
11.	23 7	16 6	13 4	14 2	16 5
18.	23 4	16 1	13 6	13 10	16 4
25.	22 9	15 6	13 4	13 6	16 2
Oct. 2.	22 6	15 0	13 1	12 4	16 3
9.	22 8	15 2	13 6	12 2	16 2
16.	22 3	14 9	14 2	12 0	16 1
23.	22 6	14 10	13 8	12 6	16 3
30.	22 9	15 2	13 9	12 10	16 3
Nov. 6.	22 6	15 0	13 6	13 0	16 4
13.	22 3	15 2	13 8	12 9	16 3
20.	22 4	15 5	13 2	12 8	16 3
27.	22 6	15 0	13 3	12 6	16 4

TABLE SHOWING THE WEEKLY AVERAGE PRICE OF GRAIN,

Made up in terms of 7th and 8th Geo. IV., c. 58, and 9th and 10th Vict., c. 22. On and after 1st February 1849, the Duty payable on FOREIGN CORN imported is 1s. per quarter, and on Flour or Meal 4½d. for every cwt.

Date.	Wheat.		Barley.		Oats.		Rye.		Pease.		Beans.	
	Weekly Average.	Aggregate Average.	Weekly Average.	Aggregate Average.	Weekly Average.	Aggregate Average.	Weekly Average.	Aggregate Average.	Weekly Average.	Aggregate Average.	Weekly Average.	Aggregate Average.
1858.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Sept. 4.	45 8	44 9	34 0	32 6	27 8	27 10	34 6	33 9	45 1	44 0	46 7	46 5
11.	45 1	44 8	35 2	33 8	25 7	27 4	33 9	34 2	44 7	44 2	46 9	46 6
18.	44 11	44 6	34 1	36 1	25 8	27 1	34 6	34 8	45 1	44 5	46 3	46 7
25.	44 2	44 6	36 6	35 0	25 1	26 6	32 7	34 2	43 10	44 5	45 9	46 5
Oct. 2.	43 2	44 2	36 6	35 5	24 10	26 0	33 1	33 9	44 0	44 4	45 8	46 3
9.	42 8	44 3	35 10	35 8	23 7	25 4	32 7	33 6	44 7	44 6	44 2	45 8
16.	42 4	43 0	35 9	35 11	22 9	24 7	32 0	33 6	44 6	44 5	44 7	45 4
23.	42 4	43 3	35 3	36 0	22 10	24 1	30 7	32 8	45 5	44 7	43 1	44 11
30.	42 10	42 11	35 7	35 11	23 5	23 9	31 0	32 1	45 7	44 8	43 6	44 5
Nov. 6.	42 8	42 8	35 5	35 9	23 0	23 5	33 0	32 1	44 4	44 9	42 9	44 0
13.	41 10	42 5	35 5	35 6	23 2	23 2	31 6	31 9	43 8	44 8	43 4	43 7
20.	41	42 2	35 1	35 5	22 11	23 0	32 4	31 9	45 11	44 11	42 7	42 4
27.	41 2	42 0	35 4	35 4	22 9	23 0	31 6	31 7	46 1	45 2	42 7	43 8

FOREIGN MARKETS.—Per Imperial Quarter, free on board.

Date.	Markets.	Wheat.	Barley.	Oats.	Rye.	Pease.	Bea
1858.		s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d.
Sept. ..	Danzig	40 0 - 50 0	25 0 - 34 6	18 0 - 26 6	24 6 - 27 0	32 0 - 45 0	36 0-
Oct. ..	Danzig	38 6 - 48 0	22 6 - 33 6	16 6 - 24 6	23 0 - 26 6	30 0 - 43 0	34 0-
Nov. ..	Danzig	34 6 - 46 6	24 0 - 32 0	15 6 - 22 6	25 0 - 28 6	28 6 - 41 6	35 0-
Sept. ..	Hamburg	40 6 - 50 0	24 6 - 29 6	17 6 - 22 6	22 6 - 26 0	31 6 - 44 0	34 6-
Oct. ..	Hamburg	37 6 - 48 6	24 0 - 28 0	16 6 - 19 6	24 0 - 27 0	29 6 - 39 9	32 0-
Nov. ..	Hamburg	35 6 - 44 9	21 6 - 24 6	14 9 - 19 0	25 0 - 29 6	28 0 - 37 6	35 0-
Sept. ..	Bremen	37 6 - 48 0	24 6 - 30 0	18 6 - 28 0	25 0 - 31 0	38 0 - 46 0	34 6-
Oct. ..	Bremen	35 6 - 46 0	22 6 - 29 0	18 0 - 27 0	23 6 - 29 0	36 0 - 44 0	32 6-
Nov. ..	Bremen	33 0 - 42 6	22 0 - 26 6	17 6 - 24 0	22 0 - 28 6	32 0 - 40 0	32 0-
Sept. ..	Königsberg	46 0 - 52 0	24 6 - 30 0	19 6 - 28 0	26 0 - 36 0	38 0 - 45 0	35 6-
Oct. ..	Königsberg	42 6 - 48 0	22 0 - 28 6	18 0 - 27 6	25 6 - 32 0	36 0 - 44 0	34 0-
Nov. ..	Königsberg	40 6 - 45 0	21 6 - 26 6	17 6 - 25 6	24 0 - 31 5	34 6 - 42 0	34 6-

Freights from the Baltic, from 2s. 6d. to 5s.; from the Mediterranean, 8s. to 10s.; and by steamer from Hamburg, 2s. to 4s. per imperial qr.

THE REVENUE.—From 31st March to 30th June 1858.

	Quarters ending Sept. 30. 1857.	Quarters ending Sept. 30. 1858.	Increase.	Decrease.	Years ending Sept. 30. 1857.	Years ending Sept. 30. 1858.	Increase.	Dec
	£	£	£	£	£	£	£	£
Customs	5,411,385	6,115,422	631,037	..	23,106,509	23,472,831	366,322	..
Excise	5,298,000	5,085,000	..	213,000	17,519,000	17,731,000	212,000	..
Stamps	1,752,225	1,831,000	78,745	..	7,346,223	7,728,343	382,120	..
Taxes	159,000	141,000	..	18,000	3,099,020	3,136,033	37,013	..
Post-Office ..	730,000	745,000	15,000	..	2,930,000	3,025,000	95,000	..
Miscellaneous	330,102	592,630	262,538	..	1,424,885	2,215,667	790,782	..
Property-Tax	4,931,537	2,454,000	..	2,477,537	15,753,024	7,852,625	..	7,90
Total Income	18,612,270	16,964,052	990,320	2,708,537	71,178,661	65,161,439	1,883,237	7,90
	Deduct Increase....			990,320	Deduct Increase....			1,88
	Decrease on the qr..			1,718,217	Decrease on the year			6,11

PRICES OF BUTCHER-MEAT.—Per Stone of 14 Pounds.

Date.	LONDON. Beef.	LONDON. Mutton.	LIVERPOOL. Beef.	LIVERPOOL. Mutton.	NEWCASTLE. Beef.	NEWCASTLE. Mutton.	EDINBURGH. Beef.	EDINBURGH. Mutton.	GLASGO[W] Beef.	GLASGO[W] M
1858.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d
Sept. ..	6 6 - 8 0	7 0 - 8 6	6 3 - 8 0	6 6 - 8 6	6 9 - 8 3	6 9 - 8 3	6 6 - 8 3	6 9 - 8 6	6 9 - 8 3	6
Oct. ..	6 3 - 8 0	6 9 - 8 3	6 3 - 7 9	6 3 - 8 3	6 6 - 8 0	6 6 - 8 0	6 3 - 8 0	6 6 - 8 3	6 6 - 8 0	6
Nov. ..	6 4 - 8 3	6 9 - 8 6	6 6 - 8 0	6 6 - 8 3	6 9 - 8 3	6 9 - 8 6	6 6 - 8 6	6 9 - 8 6	6 9 - 8 3	6

PRICES OF ENGLISH AND SCOTCH WOOLS.—Per Stone of 14 Pou[nds]

ENGLISH.	s. d.		s. d.	SCOTCH.	s. d.	
Merino, ...	18 6	to	25 0	Leicester Hogg, ...	18 6	to
.. in grease, ...	15 6	,,	18 6	.. Ewe and Hogg, ...	15 6	,,
South-Down, ...	18 0	,,	24 6	Cheviot, white, ...	15 0	,,
Half-Bred, ...	15 6	,,	20 0	.. laid, washed, ...	9 6	,,
Leicester Hogg, ...	18 6	,,	23 0	.. .. unwashed, ...	7 6	,,
.. Ewe and Hogg, ...	16 0	,,	19 0	Moor, white, ...	8 0	,,
Locks, ...	9 6	,,	12 0	.. laid, washed, ...	6 9	,,
Moor, ...	6 6	,,	10 6	.. .. unwashed, ...	6 0	,,

ENGLISH AND FRENCH AGRICULTURE.

CHAPTER I.

subject of agricultural progress is but little understood by ıerality of those who practise it, because the causes which for or against it are themselves seldom considered or ɜnded. The degree in which the cultivation of a country es, is in a great measure dependent on the social and polindition of the class into whose hands it has been intrusted, ısure of security, both political and commercial, they enjoy, ›ir freedom from molestation by foreign or domestic interand disarrangement. In the earlier periods of English , especially during the wars of the Roses, such was the in- r of property in land, and everything connected therewith, ltivation was neglected, and the land was laid down in pashich resulted in occasional famine and general dearness of ›ns. Since the Revolution of 1688 the country has enjoyed ıterrupted immunity from internal warfare, whether with ic or foreign foes; and the consequence is, that agriculıs made important and unprecedented advances in all its ɜs.

it is not through freedom from intestine war or foreign inalone that the agriculture of England has made such great ıs. The encouragement held out to it by the landed aristoheaded by the monarch himself, since the middle of the nth century, has given a stimulus to enterprise, and rendered :ivation of the land a popular profession. This has drawn n immense amount of capital and talent, by which its rehave been tested and developed in a course of experihusbandry, until agriculture has been reduced to a science, er has become the embodiment of the physical sciences, ıave all been enlisted in its service, and brought to bear s various operations.

her cause of the great progress made of late years by agriin England, is the aggregation of the land, or the absorpthe small landed properties, which were once so numerous, : estates of the aristocracy, by which a new class of cultiıas been created, possessing capital, intelligence, and enter- In this respect the condition of England differs widely ıat of any other country in Europe or on the continent of a. The condition of the latter country, indeed, is anomalous, nds apart from all others in respect to its agriculture, as we ke another opportunity to show in the course of our inquiries. ɜt task is to investigate the causes which operate against the

progress of agriculture on the continent of Europe, at the same time that it has rapidly advanced in the United Kingdom.

A short time previous to the breaking out of the French Revolution, Arthur Young, the Secretary to the Board of Agriculture in England, made a journey through France, with the view of collecting information respecting the state of agriculture in that country. At that period the old regime and feudalism existed in all their efficiency for evil and impotency for good to the masses of the people. He found the land, which, in average quality of soil and adaptation of climate, was confessedly far more favourable for agriculture than that of England, so wretchedly cultivated as to yield the minimum of produce, especially in cereals. The rural population themselves existed upon the meanest fare, as may be supposed when it is stated that a Duke of Orleans once presented to the King of France bread made from fern roots, saying, "This, sire, is the food on which your majesty's subjects are compelled to subsist."

The Revolution soon after swept like a devastating torrent over that country, leaving not a wreck of the ancient regime behind. The land, which previously had been held in immense seignorial domains, was sold as national property, and afterwards divided into small estates. Since that period, every encouragement has been given to the rural population to become owners of small freeholds, and laws have been enacted enforcing the further subdivision of the land. This system has now had a trial of sixty years' duration, and the results have been distinctly traced and pointed out by modern French authors, with an exactness and fidelity that enable us to pursue our inquiries with ease and correctness.

The example of France in the system of the subdivision of the land has been imitated by Prussia and other large states on the Continent. The object of this movement is similar to that which occasioned the demolition of the baronial castles in the United Kingdom—namely, the increase of the power of the Crown by reducing that of the landed aristocracy. In the case of the Continental states, that class has been nearly annihilated by the subdivision of their estates; whilst, on the other hand, it has given to the mass of the people a direct interest in the institutions of the country. According to Laing, this system now extends over Flanders, Holland, Friesland; about the estuaries of the Scheld, Maese, Rhine, Elbe, Weser, Eider, Ems; a great part of Westphalia and other districts of Germany; over Denmark, Sweden, Norway; and in the south of Europe, in Switzerland, the Tyrol, Lombardy, Tuscany, &c. &c. In some of these countries this subdivision of the land has been in operation many years; but in others, at the head of which stand France and Prussia, it was the direct consequence of the French Revolution, and is in itself considered, by foreseeing men, the most momentous change produced in Europe by that event, both in a political and social point of

view. It is, however, rather in the latter than in the former that we propose to examine its progress and effects upon the productive powers of the soil, and the prospect it affords of a future provision for the maintenance of the growing populations, as compared with the opposite system of aggregation, as practised in England. In fulfilling this task, whilst we shall take a glance at other countries and their agriculture, we shall consider France as the most favourable type, upon a large scale, of the Continental system of subdivision, and England as that, and the almost sole remaining example, of the aggregation of the land, at least in Western Europe. By comparing the present condition of agriculture as the results of the opposite systems in these two countries, we shall be enabled to contrast them in their influence on the social wellbeing of the peoples concerned.

We have said that the subdivision of the land in France and Prussia was the consequence of the Revolution. This is undoubtedly true; but it is worthy of observation, that whilst that event produced this social change on the Continent, the very same event caused the adoption and extension of the opposite system in England. To explain this, it is necessary to refer back to the year 1790, the period immediately preceding the war with France. At that time the number of small freeholders in England was very great, and they formed an independent body, possessing considerable. influence, both social and political. Under their management, however, the cultivation of the land was but indifferently executed. Having but little knowledge of the principles of husbandry beyond that of a stereotyped routine of the most contracted kind, its operations were studiously and implicitly based upon the practice of their forefathers, as the certain and final results of "absolute wisdom." They eschewed "book-farming" and "book-learning" as inimical to their prosperity and the precursors of failure; and experimental farming, out of the ordinary range of their operations, was with them a strong symptom of folly, if not of insanity. We well remember the contempt with which endeavours to show that a knowledge of science would be advantageous to agriculture, was received fifty years ago by some of the old farmers, who rested contented with raising their 2½ quarters of wheat per acre. We have known some who boasted of never having had a book in their houses except the Bible, Prayer-book, and *Old Francis Moor's Almanac*, which latter was consulted on all occasions of husbandry as an infallible oracle in atmospheric matters.*

* A friend of the writer's once attempted to reason with one of this class, but to no purpose. At length he said, "Well then, let us see how near his prophecies come to the truth in the present time." He then took an almanac from his desk, and read over the prognostics for the week. "There now!" said the farmer, "could anything come more exact than that?" "He certainly must be a wonderful man," rejoined our friend, "*for this almanac was published ten years ago!*"

When the war with France broke out, it entirely altered t state of the rural districts of this country. The enormous expen ture it involved soon rendered necessary a doubled, trebled, qu rupled revenue, besides an equally increased amount of local ta tion, the larger portion of both falling upon the landed intere This completely broke down the small freeholders, although t price of every kind of agricultural produce had advanced in t same proportion. It then became a question with this cla whether it would not be far better for the freeholder to sell l land and become a tenant-farmer? Let us suppose, for instan that a man possessed 50 acres of land *unencumbered* (a rare ca however), with a capital of £500 to work it. Land of a go quality would sell, at that period at least, at £50 per acre, so th we may fairly assume that he had £3000 laid fast upon his acres. It is true he had no rent to pay; but if he had a family a wife and five or six children, which every young farmer mu reckon upon, he would find it exceedingly difficult to support the and, besides, pay the numerous taxes, tithes, poor-rates, and oth local claims, with advanced rates of labour consequent on the hi price of food, &c.; all these, in fact, augmented in a far grea proportion than the increased value of his small produce wou cover. Under these circumstances would it not be more adva tageous for him to sell his land and hire 300 or 400 acres, the proper working of which, his capital of £3000 would, w economy, be quite sufficient? Such was the correct reasoning which the yeomen freeholders of England were transform into tenant-farmers, occupying larger or smaller tracts of la according to the capital they were able to command; wheth simply by the sale of their estates, or by adding to what they p duced by borrowing. In the same way the "common land which belonged to the general body of proprietors in a pari became first enclosed and parcelled out under Acts of Parliame and then, generally speaking, absorbed by purchase into the esta of the neighbouring gentry.

It is from the breaking-down of the yeomanry class that t rise of British agriculture may be dated. Possessing ample capi by the sale of their estates, they found no difficulty in obtaini farms, in many cases becoming the tenants of the purchasers, occasion offered. In the mean time it was found by the gr landowners that there was a better chance of procuring an i provement of their estates, as well as better security for th rents, by throwing the land into large farms, than by having divided into small ones. The late Earl of Leicester (then T. Coke, Esq.) was one of the first of the landed gentlemen w adopted this system on a large scale. Possibly he may be c sidered by some to have carried it too far in regard to its so bearing, but not in respect to the immediate object he had

view—that of improving by example and experiment, instituted under his own inspection, the general system of agriculture of the kingdom. His plan was to procure tenants possessing capital and enterprise, disposed and able to second his efforts by a course of experimental husbandry based upon scientific principles—little known or understood at that period, but which have since gradually gained ground, through the influence and patronage of such men as Mr Coke and the Duke of Bedford, who drew around them men of science, to whom every encouragement was given to devote their time, talents, and skill to the advancement of agriculture, by bringing chemistry and the other physical sciences to bear upon it, in order to develop more fully its resources. It was to the light thrown upon the subject by such men, and the knowledge diffused through their efforts by the medium of agricultural societies and literature, that we must ascribe the vast and rapid improvement that has taken place, such as no other country in the world can exhibit, and which, we venture to say, would never have been effected under a system of subdivision like that of the Continent. If this latter assertion is doubted, let us follow our imaginary yeoman freeholder, with his fifty acres of land and his family of five or six children, through the extent of his career.

The estate would of course be considered, from the first, the reversionary property of the oldest son, and the father would consequently have to make provision *out of the profits* for his other children. Now, supposing that after paying all current expenses, he was able to lay by, upon an average, say £50 per year,—as life is uncertain, this surplus must go, not to improve the farm, and thereby further enrich the heir-at-law, but to be invested in some kind of valid security, there to accumulate and form a provision for his wife and the younger children in the event of his death; or to portion them off, if he himself lived to see them grow up and settle in the world. We say that it would be neither wise nor just for him to expend his savings in improvements from which neither he nor his younger children might ever reap any benefit, but which would devolve upon one of them only, to the prejudice of the rest. And thus, although in the course of ten, twenty, or thirty years, he might accumulate some three or four thousand pounds in cash by the help of a rigid parsimony, that principle itself would operate as a bar to all improvement; and he would be found at the end of his course as wedded to routine, and as great an enemy to farming by "book-learning," as were his ancestors before him.

As the war with France progressed, and continental Europe became involved in the struggle—at one period wholly in the interest of the enemy—it became more and more obvious that the United Kingdom would be necessitated to depend upon its own resources for a supply of bread-corn. On the other hand, the

high price to which every kind of farm produce had reached, the success of those farmers who had possessed themselves of extensive tracts of land, and the precariousness of all commercial enterprises, to which we may add the popularity agriculture had acquired through the patronage of so many members of the highest aristocracy, more especially headed as they were by the sovereign himself, induced a great number of capitalists to embark their money in the cultivation of the land. Many of these were men of extensive knowledge and liberal minds, alive to all improvements, unsparing of expense in the prosecution of experimental husbandry, and addicted by habit to ratiocination rather than routine, to "book-learning" rather than tradition. We have known many such men, who, like "Talpa," plunged into the seeming vortex of a large farm, the management of which was previously a complete riddle to them; but being free from all preconceived notions and prejudices, they were compelled to derive *all their knowledge*, in the first instance, from books. Unfettered by traditional routine these men have carried out the theories they have found laid down by writers on agriculture, and by their success have thrown the practical knowledge of their less intelligent neighbours into the shade. By such men and such means new ideas have been infused into the general body of agriculturists; gradually enough it is true, for of all men the old British farmer, owing to circumstances over which he had no control, was the most ardent devotee to professional prejudice. It required, indeed, two whole generations to pass away before any considerable progress was effected in the enlightenment of the class; and the obstacles opposed to it were only overcome by the steady perseverance of those eminent men who took the lead in agricultural affairs.

Amongst the first and most efficient and popular of the methods by which the change was effected, may be reckoned the "sheep shearings," as they were termed, instituted at Holkham, the seat of Thomas William Coke, Esq., and at Woburn Abbey, the noble residence of the Dukes of Bedford. These annual festivals at the latter place were discontinued upon the death of Francis, Duke of Bedford, about the commencement of the present century; but the "Holkham sheep-shearings" were continued up to the year 182[illegible] and until the noble owner of the property felt that advancing years admonished him to withdraw from active life.

To these annual gatherings, farmers, noblemen, gentlemen, men of science and literature, manufacturers, both natives and foreigners from all parts of the world, &c., resorted in vast numbers, and received that cordial and unassuming welcome, for dispensing which their host was so eminently noted. Three days were devoted to the festival, during which the domain, with all its improvements, was open to the inspection of the visitors, and persons were appointed to afford every facility and information that we

required. Each day a princely entertainment was provided at "the Hall" for five or six hundred guests, who were invited by cards given by Mr Coke himself; but the writer has heard him say, upon a person being introduced, "I have no more cards left, but I shall be happy to see you all, and shall give instructions to that effect to the servants." The entertainment was succeeded by speeches, from men of eminence and experience, on the various improvements in progress or in contemplation. The breeding and grazing of cattle and sheep were the especial objects of attention; and it is to the stimulus given on these occasions that the wonderful perfection to which those branches of rural economy have arrived is in a great measure to be ascribed, as well as the improvement in the various implements of husbandry. Knowledge has thereby become diffused, and a spirit of enterprise and emulation excited, by which the most marvellous results have been produced.

One of the greatest and most general of the advantages arising from the "sheep-shearings" and other kindred festivals, is the social character they imparted to the agriculturists as a body. In former times the British farmer was a much more isolated being than at the present day, only mixing in society at the market or the fair, and then for immediate business. When that was transacted, he either returned home at once, if he was a steady man, or joined his brother farmers in a drinking revelry, if not. We have known men of the latter class, who, fifty years ago, would remain for days together at a market-town as members of a "six-bottle club;" and they only separated when their business at home compelled them to do so. Such degrading and destructive customs have now happily in a great measure ceased, and given place to more rational means of enjoyment. This, however, and similar but less glaring habits of dissipation, were almost the only social meetings in which the farmers indulged amongst themselves. But by the influence of these annual and other periodical gatherings, a more rational and humanised spirit was diffused. It was found that society was intended for more beneficial objects than dissipation, and that the glory of man did not consist in the quantity of wine he could carry off from table without being intoxicated. Agricultural clubs and societies are still organised, and even multiplied; but their object now is the acquisition and diffusion of useful knowledge, tending to the improvement of agriculture. At the meetings of these institutions, subjects of interest are discussed and canvassed on all points, and a spirit of emulation and rivalry is excited, both in the cultivation of the soil and in the breeding, rearing, and fattening of animals, and the improvement and invention of implements and machinery, the good effects of which have daily become more and more developed. On the other hand, the physical sciences have been popularised, and systematically applied

to the cultivation and treatment of the soil. Chemistry, with i occult elaborations, has lent its aid, and introduced a more perfe adaptation of the three main elements of production—*soil*, *seed*, an *manure*—to each other, and is now viewed as the indispensabl auxiliary of good husbandry. The man of science and the pra tical farmer meet on the same platform, not, as formerly, with a kin of mutual contempt—the one, at the ignorance and prejudice the practical man, and the other at the learned assumptions of th theorist—but for the purpose of comparing theory and its dedu tions with practice and its results, the one describing the objects analytical processes, the other gratefully accepting, with the vie of reducing to practice, the suggestions thus freely offered.

CHAPTER II.

Whilst the seeds of a sweeping political revolution were bein scattered broadcast in France, by which the very foundations society were torn up, and by the concussion of which the who civilised world was shaken to its centre, a revolution of anoth kind, peaceful and beneficent in its operation, was in progress i England. It was instituted under the auspices of an eminent ma —Arthur Young—to whom we have already referred, and wh as an experimental agriculturist, spared neither money nor labo in the prosecution of his efforts to raise the character of Briti husbandry. By his system of management, which was general adopted, he increased the value of the inferior lands of Norfo and Suffolk, and ultimately other districts of the kingdom, fro 5s. to 25s. per acre. The Holkham chieftain, whose accession the estate took place at an early period of Mr Young's career, w his friend and pupil in agriculture. By following his advi Holkham itself was converted from a barren waste—a rabb warren—to a flourishing and productive farm, and the value the whole Holkham estate of 30,000 acres was increased fro £300,000 to at least £1,200,000; thus doubling the £400,0 expended in improvements. The plantations he formed he liv to see grow up to splendid woods, and actually had two vess built at the neighbouring port of Wells, of the timber from o which he himself had planted.

The system of improvement adopted by Mr Coke extended the neighbouring counties of Lincoln, Cambridge, Bedford, Nor ampton, &c., &c. In the two last named the Duke of Bedfo holds large property; and the successors of Francis, alrea referred to as the colleague of Coke, by pursuing the same cou in the management of the estate, have doubled its value. In L colnshire, Lord Yarborough also has followed in the steps of Col and his estate of 30,000 acres, which in the middle of the 1 century was only rated at £3000, or 2s. per acre, now realise

rental of £30,000. In these and other cases, the large-farm system has been adopted with similar success, and generally upon the most inferior and unpromising soils in the kingdom, if we except the mountainous districts. In the rich lands of the western counties much less progress has been made; and, as a general rule, the poorest soils are better cultivated, and rendered comparatively more productive, than the rich fertile ones of the west, where more attention is paid to grazing, breeding, and the dairy, than to improvements in agriculture. Where, however, the best soils have been cultivated on the improved system, the results have been extraordinary. We have heard recently of several cases in which a produce of 10 quarters of wheat per acre has been realised by high farming and draining; and having *seen* 6 quarters of the same grain per acre produced on a sheer gravel, we can believe the former statement, convinced as we are that there is no assignable limit to production, if the proper means are adopted for promoting it.

In speaking of the agricultural institutions of other days, we must not forget the eminent services rendered by the Board of Agriculture, or of the labours of its indefatigable Secretary. That gentleman is entitled by his patriotic efforts to be considered the father of British agriculture, it having been under his instructions that the foundation of all our improvements was laid. His *Annals of Agriculture,* the first periodical of value on the subject, was a work of rare merit at that period, not merely for the valuable information it contained, but because by its suggestions and experiments it induced a habit of thinking; and although agricultural chemistry was then in its infancy, and even its nomenclature was not formed, and the experiments of Young were sometimes crude in execution and indistinct in results, they were the pioneers of the system by which chemistry has since been made familiar and popular. If the mind of the husbandman has been directed to the study of this and other of the physical sciences, it is in a great measure owing to Young and his contemporaries, as the leader amongst whom he no less deserves a monument to his memory than the "hero of a hundred battles."

In regard to agricultural institutions, the crowning one is the Royal Agricultural Society of England, established in the year 1838 under the auspices and presidency of His Royal Highness the Prince Consort, who, in thus taking agriculture under his patronage, has followed the example of the grandfather of the Queen. With an income of £10,000 a-year, this Society has effected an immense amount of good to the interests of agriculture, not only of England, but throughout the civilised world. In the interval between the time when the active patronage of George the Third ceased, to that when the prestige of Prince Albert's name was connected with the Society, English husbandry had progressed under difficulties of no ordinary char-

acter, in the face of which, however, it never ceased to advanc Just at this latter period the introduction of guano took place, an its surprising effects on vegetation taught the farmer the secret o the utility of the condensation of manures, by which a great an beneficial change has been effected in that department of rura economy. The labours of the Royal Agricultural Society hav come in timely aid to forward those important improvements whic this change has originated, and which, still in their infancy, ar destined to increase indefinitely the produce of the kingdom.

Of all the innovations of the last half-century, the application o steam as a motive power to the various machines and implements o husbandry is the most important, and the one likely in the end to produce the most extensive changes in the economy of the farm Already every operation for the disposal of the crop, when secured is performed by this powerful agent, and the ingenuity of th machinist is now upon the stretch to invent the best mode o applying it to the aration of the soil. Considerable advances hav been made towards the accomplishment of this important object and the *principle* of steam-ploughing is shown to be perfectl practicable. The only point now wanting to secure its introdu tion into general use is, the discovery of the best and most econo mic mode of applying it. To effect this the first machinists of th kingdom are now engaged, and there is no fear but that the obje will at no great distance of time be accomplished, and that ere lon a more expeditious, more deep, and more perfect mode of tillag by which the soil will be completely pulverised, will be introduce and the labour of the husbandman at the same time be still furthe lightened.

This short history of British agriculture for the last sevent years was necessary to explain those results which have given t the rural economy of England a world-wide fame. Before referrin to those results further, with the view of comparing them wit those of other countries, we propose to take a glance at the syste pursued in France, especially as regards the management of th land, and of some other of the largest states on the Contine and their agriculture.

There is reason to believe that in former times the agricultu of France was more favourable to production than under the syste now pursued. A late writer on this subject,* in *A History of t Rural Classes in France*, has shown that in the sixteenth centu with much fewer means of working, there was more enterpr amongst the cultivators than at present. We boast here of Tull as having thrown the first light upon husbandry, by starti theories which, although ridiculed at the time, have since b

* M. Henri Doniol.

found to be strictly in accordance with truth and science. France also has had a Bodin, who condemned the system of fallowing; a Palissy, who exposed the injury inflicted upon agriculture by the indifference of the proprietors to the welfare of their tenants, and the bad use made by the latter of their manures. The same writer, two centuries before the application of chemistry to agriculture, asserted the fertilisation of the soil by the ammoniacal salts. "If we would believe certain modern writers," says Billon, "we should think that *now* all things are so enlightened, that we have surpassed our ancestors, particularly in agriculture. At the present time we produce at most four or five times the seed. Olivier de Serres, fifty years later than Palissy, considered it only a fair crop if he had five or six!"

The abolition of feudalism in France, and the alienation of the landed property of the aristocracy, led to the subdivision of the land, and reduced the rural population to one class, between which and the government there was no intermediate class to take an interest in agriculture. A new aristocracy was created under the Empire, it is true, but it was a military one, which held all industrial occupations, except that of arms, in utter contempt, especially that of husbandry. If they acquired estates, they left the management of them to their stewards, and neither party interfered in the cultivation. Military glory, in fact, was the ruling passion, and the occupations connected with its acquisition were the only honourable employments in their estimation—the only objects that attracted their attention, and absorbed their time and talents. Thus, the land was left to the care and management of the lowest, the most needy, and most ignorant of the people.

By far the greatest part of the estates of the ex-noblesse were sold under the Republic in small lots, and thus became subdivided into as many freeholds. Under this system a large proportion was parcelled out in small pieces, between which—there being no fences—the entanglement was anything but favourable to agriculture. By interchanging and purchase, these slips of land (in many cases not more than 300 or 400 square yards) have become so intermixed as to cause the greatest inconvenience and embarrassment to the owners. Having no outlet or access except across the neighbouring properties, it may be readily conceived what forbearance is mutually required to prevent litigation and ill-will. By the present law of inheritance, too, the evil is daily increasing. Upon the death of a proprietor, his landed as well as other property, be it ever so small, must be divided equally amongst his children, male and female. To such a length is this "*morcellement*" carried, that the most strenuous advocates of the system begin to be alarmed for the social consequences, and announce that the time is come to put a stop to its further progress, if not to retrace their steps in legislation by promoting the aggregation of the land.

"The present system," says a late writer,* "is at an end. It leads to a result which a bad season has *revealed* but not *created*, and which is destined to survive the abundant harvest of 1857. Our cultivators are involved in debt, and labour to extricate themselves to the destruction of both body and soul. The only remedy for this critical condition will be a modification of the system of cropping, by multiplying the growth of green and root crops. But this *change is impossible* whilst the land remains entangled as it is. 'How could we,' say the cultivators, reasonably enough, 'make artificial pastures in the interior of our fields, destitute as they are of an outlet? We cannot grow anything but wheat or oats on the soils best adapted to those cereals, and we could not cross with cattle over fields covered with those crops. The state of the land points out the only course of husbandry we can pursue!"

Even in those departments of the country which are considered to afford the most favourable features and results of the system, the evil has arisen to the greatest height. Thus in the *Bas Rhin*, the prefect states, "The productive part of the department represents a vast chess-board of 390,000 hectares,† cut up in squares of unequal sizes, the average extent of which is only 17 ares (or less than half an English acre). Under this system, the produce is decreasing; and to make up the deficiency, the meadows and pastures are broken up and sown with cereals under the triennial course of cropping. The sheep are fast disappearing from the district, and the average returns of cereals are still diminishing. On the other hand, in twelve departments the population in five years has diminished to the extent of 200,000, and a similar diminution has taken place in other rural districts." Under these circumstances, M. de Lavergne, one of the warmest advocates of the theory of subdivision, has been staggered by the facts that have recently been brought to light, and says—"The moment appears to have arrived at which the system has reached its maximum, and at which a reaction should commence. All the information that reaches us from that part of the country is unanimous in attesting it." In some cases in which parties have purchased twenty or thirty of these parcels of land, "he has them scattered throughout the extent of the commune, without any communication between them, or possibility of access, scarcely a twentieth part of them abutting on a highway or road of any kind."

Such is the consequence, after seventy years' experience, of the system of subdivision adopted in France under the Republic, and continued through the incessant political changes that have since occurred. Lavergne proposes to remedy it by an exchange of lands—voluntary, where it can be so effected, but compulsory,

* M. Pariset.

† The hectare contains 2 acres, 1 rood, 35 perches, English.

rather than not at all. But even this, if the present law of inheritance still continues, will soon be nugatory, owing to the repeated subdivision of small properties on the decease of the owners, which would render it necessary in a few years to repeat the operation. So pressing, indeed, is the exigency, that the same eminent writer proposes to modify the law of succession, by making it optional on the part of the eldest son, upon the death of the father, to pay the younger branches of the family their share of the property *in money*, instead of apportioning the land amongst them, which, by the 826th article of the Code, they can now demand. He proposes to suppress this part of the law, the evils of which he now admits. "We know indeed," he says, "what happens in consequence of the 826th article. Not only is the landed property of a father of a family divided, after his death, amongst his children, *but each of them can demand a part of each field*; so that the number of parcels is frequently greater than that of the heritors. Suppose the defunct left four children and four fields, the first à tilled field, the second a wood, the third a meadow, the fourth a vineyard. If each of the children exacted his portion of each, as he has a right to do, the four parcels would be divided into sixteen. Any law more injurious to the prosperity and progress of agriculture, and consequently to the public welfare of a country, it is impossible to conceive." But M. Lavergne is still fearful of going too far in his remedy, and proposes that the *daughters only* should be debarred from any share in the real property, if the personals are sufficient to make up their quota of the bequest. We fear, however, that this would seldom be of any avail, most of the land being heavily mortgaged, so that it would require all, and in many cases more, than the personals would realise, to pay off the encumbrances.

The Council of the Bas Rhin, in the session of 1856, proposed a law fixing the minimum quantity of land below which a subdivision ought to be prohibited. M. Lavergne considers this to be impossible; for if the minimum was fixed too low, the effect would be nugatory; and if too high, it would interfere with the freedom of transactions in land. It is very evident that the most strenuous supporters of the system of subdivision begin to see the evils of it, and are gradually changing their opinions. They will probably attempt to alleviate those evils by such modifications as have already been proposed. But by whatever slight changes they may endeavour to remedy the more palpable vices of the system, those inherent ones which belong to the principle itself cannot be modified, and nothing but an entire abrogation of the law can avert the disasters that it will eventually bring upon the country. The fact is, the small-farm system belongs to a bygone age, and a condition of society which has long since passed away. The enormous extension of commerce and population in both France and England,

renders it necessary, in those countries at least, to increase instead of diminishing the produce of the land; and this can only be effected by the aid of an intelligent, enterprising, and wealthy body of cultivators, alive to every improvement, and able to carry them into effect. This is utterly impossible under the small-farm system, as is fully exemplified in France at the present moment. With a landed proprietary of nearly five millions, holding under an average of five acres each, without roads to convey their produce to the best markets, or means of any kind to make the most of their land, poverty, ignorance, and parsimony, necessarily attendant on the system, present an insuperable bar to all agricultural improvement.

We have already referred to the military spirit prevalent in France as inimical to the progress of agriculture. This is largely aggravated by the operation of the conscription law, by which 80,000 of the rural population are annually taken from the plough and transferred to the army, where they remain for three years, to the destruction of their morals and the injury of their industrial habits. The military spirit, too, which such an alienation from the ordinary avocations of rural life is calculated to engender, is hostile to the progress of husbandry in particular, because the cultivation of the land is considered by the French military hierarchy the most low and vulgar of occupations. This feeling is superinduced by the system of subdivision, by which so large a portion of the soil is committed to the management of men far below the English labourer in point of intelligence and social comfort. Of the political effects of the conscription law we do not intend to speak, but with the demoralising influence of a three years' sojourn in the French army, may be coupled the *taste* for military life engendered by its half-exciting, half-idle occupation; entered upon at that period of life when habits become fixed, and it is of the first importance to give them an industrial bias. The license permitted in the army is as inimical also to the moral feeling as to industrial habits of the conscript, who, at the end of his three years' initiation into military life, returns to his home a different man, probably with a feeling of contempt for his former occupation, and a longing desire to return to the army; which, if it is a life of danger, is also too often one of unchecked licentiousness and partial idleness.

The *metayer* system, as practised chiefly in the south and centre of France, is another of those customs calculated to perpetuate the social degradation of the French husbandman, by the severity with which it presses upon the unfortunate tenant, from whom the proprietor takes a share of the produce in lieu of a money rent. This share sometimes amounts to two-thirds, never less than one-half, of the produce. M. Lavergne, in his work on *The Rural Economy of England*, &c., says, "Let us suppose the land of England divided according to the Arcadian notions of some philanthropists, so that each of her population may have,—not a rood, as

Goldsmith states, but—two acres, which will be about the quantity required. Such is the case with the south and the centre of France, where the metayer system prevails. There the cultivator has nothing to dispose of. Why does he work? To feed himself and his master with the produce of his labour. The master divides the produce with him, and consumes *his* portion. If it is wheat and wine, master and metayer eat wheat and drink wine. If it is rye, buck-wheat, and potatoes, these they consume together. Wool and flax are shared in like manner, and serve to make the coarse stuffs with which they are clothed. Should there happen to remain over a few lean sheep, or some calves reared with difficulty by overworked cows, whose milk is disputed with their offspring, they are sold to pay taxes. This is the only possible system in a country where markets are wanting."

Of the depressing moral and social effects of so degrading a system, and of the disgust that men enlightened in other respects, who have never seen agriculture under any other form, must feel of them and their occupation, may be judged of from the following quotation from the work of a popular author (Bruyère), in which he gives a description of the French husbandman: "We behold throughout the country a set of ferocious-looking creatures, both male and female, dark, livid, scorched with the sun, attached to the land, which they dig and grub with an untiring pertinacity. Their voice is that of a man, and when they rise on their feet they exhibit a human countenance. They are, in fact, men. They retire at night to their dens, where they live upon black bread, water, and roots. They save other men the labour of sowing and reaping, and certainly do not deserve to be without that bread which they themselves have raised."

This description of a husbandman is widely different, not only from that given by the English rural poets, Thomson, Gray, Shenstone, &c., but equally so from a truthful portrait of the English agricultural labourer of the present day. The account of Bruyère, however, is fully borne out and corroborated by recent English travellers in France, who represent the condition of the rural population of that country in quite as unfavourable a light as that writer, and as being worse even than that of the Irish peasantry previous to the famine of 1847. The metayer system, in fact, is an expedient arising out of the exigent poverty of both the proprietor and the occupier. In no other way could the land in the south and centre of France be cultivated at all.

Another of these expedients to supply the place of capital on a farm, unknown in this country, is the *Bail à Cheptel*, or the lease of cattle. This consists in a rich farmer letting out cattle of every kind, to enable the poor farmer to consume his grass, roots, &c., and receiving for the hire half the increased value of the stock thus leased. By no other means could a poor farmer convert his green and root crops; and probably, if the transaction were left to

the free management of the two parties to make their own terms, it might prove advantageous to both. But here, unfortunately, as in almost everything else, the law interferes, and imposes such restrictions on both lender and borrower that none but the most needy would avail themselves of the *cheptel*, nor would any but usurers supply them at the enormous risks the system involves. For instance, in the case of cattle and sheep, the farmer takes half the wool of the latter, half the increased value of either, and all the manure. This may or may not pay the lender, according to the tendency of the animals to improve. But in the case of horses and milch cows, both of which are worked to the utmost, the former *decreases* in value continually after a certain age, and the lender of them receives nothing for his outlay, whilst the borrower has the labour and the manure for the keep and care-taking. And with respect to the milch cows, the borrower claims the milk and manure, whilst the only return the lender receives is half the value of the calf, which is generally sold at a month old, and half the improved value of the cow, which, as it is both worked and milked to the utmost, is in most cases *nil*. On the other hand, if swine are the animals under *cheptel*, as a pig will treble its value in twelve months, but at a considerable expense of food and attendance, the lender in that case will receive cent per cent for his outlay, whilst the borrower will have the manure and half the increased value for his share in the transaction. As a specimen of the working of this system, we copy the following statements from a paper on the subject by M. Talouteux, inserted in the *Journal d'Agriculture Pratique*:—

"Let us take a flock of merinos of 300 ewes, costing each 17f. 50c., and weighing on an average, with the lamb by its side, 43 kilogrammes live weight.* The total value of the flock will be 5250f., and the weight 12,900 kilos 'on foot.' Admitting that each quintal of flesh receives daily a ration of 4 kilos of hay, or an equivalent nourishment of other food, which is quite little enough for a flock of breeding ewes, the daily consumption of the flock, including the lambs, will be 516 kilos (1 kilo 72c. per head), and the annual consumption 188,340 kilos of hay. Reckoning the hay at 3f. the metrical quintal, the expense of food will be 5650f. Let us further suppose that the flock, according to the practice in part of the department of the Aube, the Haute Marne, and the Cote d'Or, lodges all the year in the fold, it will require, whether for litter or the rack, 2850 kilos of straw, or 15 per cent of the gross weight of the forage consumed. At 20f. per thousand, the expense of litter would amount to 564f. Other expenses will amount to 700f. for shepherd's wages, 441f. for accidents and deaths (being 7 per cent of the value of the flock); and lastly, 150f. for hire of building and wear and tear of utensils."

* The kilogramme weighs 2 lbs. 3 oz. 4·428 drs. avoirdupois; the quintal, 112 lbs.; the *metrical* quintal, 100 kilogrammes, or 220 lbs.—SPIERS.

'The products will be, first, 270 lambs (90 per cent of the ewes), ghing, at six months, 23 kilos each, or 6200 kilos in all, live ght, which, at the rate of .54c. per kilo, forms a product of value of 3354f.; secondly, 600 kilos of wool, washed on the k; thirdly, in manure, a value of 2.190f., at the rate of .02 head per day.

'The amount, therefore, stands as follows:—

Dr.		Fr.
Food, valued in hay, ...		5650
Straw for litter, &c., ...		565
Shepherd, and other attendants, . .		700
Accidents and deaths, ...		441
Hire of the fold and utensils, . . .		150
Cr.		
Value of the lambs, ...	3354	
,, wool, ...	2400	
,, dung, ...	2190	
Profit, ...		438
	7944	7944

'Such was the profit received by the owner of a flock of ewes. t what would have been the result if, instead of being the pro- etor, he had held the same flock merely on *cheptel?* In that e, he would not, it is true, have had to expend a first sum of 50f. in the purchase of the 300 ewes, but he must reckon the pense of—

	Fr.	Cts.
1. All the food and litter, . .	6215	0
2. Expense of attendance, . .	700	0
3. Hire of fold, &c., . . .	150	0
4. Half the expense of insurance, .	220	50
	7285	50

return for this outlay he would take—

	Fr.	Cts.
1. Half the value of the wool, . .	1200	0
2. Half the value of the lambs, . .	1677	0
3. All the manure, . . .	2190	0
	5067	0
Leaving a dead loss of, . .	2218	50
	7285	50

'But we must complete the parallel by showing the share of owner of the sheep in this rearing account, and nothing can be re easy to state.

'The lender advances—

[redacted]

		Fr.	Cts.
1. The purchase-money of the flock,	.	5250	0
2. Insurance,	. . . .	220	50
		5470	50

"Thus, after receiving back at once his capital purchase-money, he realises in addition his part of the increase, namely—

		Fr.
1. Half the growth of the lambs,	. .	1677
2. Half the value of the wool, .	. .	1200
		2877

Amounting to 52$\frac{7}{10}$ per cent on his capital employed! Can this honestly be called promoting the production of cattle, when the capital lent *in kind* thus appropriates to itself the lion's share?"

The want of markets, or rather of public roads, to convey the produce to the markets,* is undoubtedly the great defect in France. But it is a question whether this is not, to a very considerable extent, the *result* rather than the *cause*, of the poverty of the rural population. Had the land, for instance, been divided, even partially, into large farms, necessarily occupied by capitalists, is it not more than probable that means would have been found for taking the produce to market, and even for *creating markets*, by inviting manufacturers to settle amongst them, as has, in some cases, been done in England? In the north-west of France, agriculture is in a much more promising state, a large section of the population being engaged in commerce or manufactures, which create markets for agricultural produce. The land also is let at money rents, and upon long leases, instead of being subject to the metayer system. In that part of France it is estimated that production has quadrupled, and the population doubled, itself during the present century, whilst rents have risen tenfold in the same period.

The evils attached to the system of the land in France are greatly aggravated by the continual interference of the Government, which takes cognisance of agriculture as well as everything else in the social arrangements of the country, whether for the purpose of what it calls protection, or for that of keeping down the price of provisions. Thus, the law which for two or three years prohibited the exportation of grain, was felt by the agricul-

* The following is the comparative extent of public roads in England and France in 1848:—

Turnpike roads in England, exclusive of private roads, &c, all in good condition,	. . . . .	22,382 miles.
Public roads in France,	. . . . .	10,716 "

The English roads are constructed and kept up by the people themselves, the French roads by the Government. The deficiency in the French means of communication have since been in some measure obviated by the extension of the railway system; but the want of roads is still felt in many parts of the centre and south of France.

turists most oppressively. In some districts, for instance, maize is extensively cultivated, but not consumed, being grown expressly for exportation; but so strict was the law, and so rigidly was it enforced, that the growers were forbidden to export it by sea to those parts of France in which it was in use, as well as to foreign countries. Ireland at that period would have taken large quantities, it having become a considerable article of consumption in that country since 1847. The consequence was, that not only was the price reduced to one-half of its usual amount, but the stocks of that grain accumulated to such an extent as to prevent the further cultivation of it. So loud, however, were the complaints and remonstrances of the landed interest, that at length the Government was compelled to rescind the decree, and give freedom of export or all kinds of grain.

Nothing is done in France without the surveillance of the police, which at times is carried to the most ridiculous length. It will carcely be credited in England, that on the eve of last harvest, a armer having a field of wheat very much laid, and wishing to cut it reen in order to prevent its being spoiled, was forbidden to do so y an inspector of police, it being, as he alleged, unlawful to cut corn nripe. A remonstrance from the farmer to the Secretary of Agriulture certainly superseded the police law, but at too late a period o save the wheat from injury. It was found, upon referring to the ecree upon which the inspector interfered, that it could not strictly e interpreted to extend to the act in question. But it is quite enough hat a law exists capable of so doubtful an interpretation, which, ith another and less liberal secretary, may be productive of a ifferent result. Where the people are liable to such interferences n the management of their private concerns, they can never feel hemselves safe in any transactions. Centralisation, and its necesary coadjutor, *red-tapeism*, are in fact so completely carried out in rance, and have so brought every department of industry directly nder the power of the sub-officials of Government, that whatever ursuit a man engages in, he finds himself cramped and fettered y the continual fear of coming under the denunciations of the aw. All trades embracing articles of general consumption, as utchers, bakers,* &c., are placed under the management of a set f officials specially appointed, by whom every operation is reguated in accordance with decrees promulgated for that purpose.

* Until within the last twelvemonth, the number of butchers in Paris was restricted by law, and these could only purchase at two prescribed markets. The eat, too, must be ranged under four distinct qualities, with prices accordingly; ith a hundred other as absurd regulations, and half-a-dozen intermediate functionries to see to their observance. The object was to *keep down* the price of meat, nstead of which, it was found that by a little management the butchers converted ll the inferior meat into the best, and rapidly grew rich under the system, whilst oth the growers, or graziers, and the consumers were the sufferers. The system as consequently abandoned, but the trade, as well as that of the baker, is still nder injurious regulations.

By the system adopted, and in full operation in France, the principles of economic science are set at defiance. And what is still worse, false principles and ideas are cherished amongst those classes wholly unenlightened on economic subjects, and too apt at all times to yield without examination to the supposed superior intelligence of their rulers.

France is not without her agricultural societies and institutions, and great efforts are made to render them efficient. But what is done in England by the spontaneous energy and enterprise of the agriculturists themselves, is there arranged, as well as originated, under the management and control of the Government. The consequence is, that that deep interest which is felt in these associations by the whole body of those connected with agriculture in England, and which originates in the share which each has had in its rise, progress, and management, is confined in France to a few intelligent and enterprising individuals, whilst the far greater number never attend them, or do so in deference to the authorities, without feeling any interest in them. This is generally complained of by those who have the conduct of the societies, as well as the stoical indifference displayed by the non-agricultural portion of the people. Whilst in England, for instance, at the great cattle-show of the Smithfield Club at Christmas, a multitude of persons, of all ranks and professions, visit, and display as much interest in it as the farmers themselves,—a kindred institution at Paris, inaugurated by the Government, and got up at an enormous expense, was almost ignored by the Parisians, extremely few of whom attended it at all, and those few appeared to take but little interest.* In fact, the fondness of rural pursuits which pervades the masses of the people of England, from the sovereign to the humblest labourer and mechanic, and in patronising which the proudest nobles of the land feel a pride and pleasure, is totally absent in Parisian society, where a taste for artificial life, and the popularity of the military hierarchy, have banished all sympathy with rural life and pursuits, leading them to consider the practice of husbandry itself with silent contempt, as a mean and degrading occupation, quite beneath their notice.

Much of the difference in the progress made by the two countries in agriculture is due to the difference in their political condition. Since the Revolution of 1688 in England, that country has, with a very slight and transient exception, been free from internal discord; and no foreign foe has carried war into her plains. A mild

* This reminds us of an attempt of the Duke de Bouillon, who had resided for many years in England, to establish a "*Beef-steak Club*" at Paris during the old régime. "The bows and simpers of the aristocrats, the giggling and gesticulations of the musical guests, and the gabble of all:—At last," said the Duke, "I called for a song; I looked for the astounding voice of a Bannister; when a man rose and commenced crying, '*Amour! amour!*'—I could no longer stand it, but stopped my ears and ran out of the way." So difficult is it to alter the habits and feelings of a people.

and paternal, but firm Government, appreciated by the people, and constantly increasing in its hold upon their affections by a gradual extension of their liberties, has given security to the various interests of the country. Every branch of industry, whilst left to conduct unmolested its own affairs, receives a general encouragement and attention. And however erroneously the Government patronage and protection may formerly have been exercised, it was with an earnest desire to promote the public welfare, and as such was received by the people. Even the wars in which England has engaged, have, in the end, extended rather than retarded her commercial and agricultural prosperity, exempt as she was from being the scene of contest. Her free constitution has enabled the people, without either national or local convulsion, to demand and obtain those reforms which the increase of political knowledge and intelligence rendered both safe and expedient; and it may now with truth be said that she possesses more of republican freedom, both in legislation and execution of the laws, than exists under the government of any nation on the earth.

France, on the other hand, from the same period (1688), "has had a succession of dark clouds hovering over her political hemisphere, which from time to time have burst in storms and tempests." Exhausted by the wars and extravagance of Louis XIV.—especially that crowning act of folly, the revocation of the Edict of Nantes, by which thousands of her most wealthy and industrious citizens were banished, and transported their skill, intelligence, and wealth, with their industry, to foreign countries—she has never since had a sovereign (with the exception of Napoleon I.) who has paid any marked attention to the interests of commerce and agriculture. Under the old regime, her rulers were too much addicted to gross and sensual indulgences and royal magnificence to regard with anything but indifference the requirements of these two great interests, and both remained in a stagnant state. The efforts of Napoleon I. effected something considerable towards the revival of agriculture; and by calling science to its aid, he laid the foundation of the new system of husbandry which has been adopted and so successfully carried out in England. But so far as the agricultural body in France is concerned, if we are to judge by the statements of French authors of the first note, the efforts of the French Government to revive agriculture were like those applied to a dead corpse by the galvaniser—mechanical *vitality* was temporarily restored, but conscious life was still extinct. The military hierarchy had over-ridden every other class, infusing into them its pernicious principles and feelings, and destroying that love of rural life which certainly existed under the ancient regime, whilst the chateaus existed, and were occupied by the owners of the soil, the old noblesse. Thus, those tastes and feelings are wanting which alone can give life and vigour to agriculture.

"The true ballast," says M. de Lavergne, "of the body politi in England is the country feeling. This feeling, no doubt, is of an aristocratic kind, but it is not aristocracy itself; both may exist independent of each other. British aristocracy has made common cause with the country feeling, and this is what constitutes its strength. French aristocracy holds itself aloof from it and herein lies its weakness. In England the country life o the upper classes has, in the first instance, produced energeti and high-minded habits, out of which the constitution has take its rise; and thus, owing to those very habits, liberty has bee prevented from running into excess. This liberal and conserva tive element has been wanting in France. In our own day, formerly, absenteeism has affected, even in a political point view, nearly all the mischief; and this is the reason why the two apparently distinct causes of prosperity,—liberty witho revolution, and the country feeling,—are really but one."*

The unsettled state of politics in France, and the contin changes in the form of government since the breaking-up of t old monarchy, has much to do with the want of prosperity agriculture. The struggles for liberty during the last seve years in that country have been totally unsuccessful, althou in that period it has had eight changes in the form of gove ment. On each of these occasions the abstract principles liberty have been laid down clear enough as the basis of a futu constitution—only, however, to be departed from almost imm diately; and now, at the end of this term of seventy years, see established a more grinding despotism than ever, by wh *the Press*—the ordinary voice of the people—is destroyed; an mournful silence, enforced by the most arbitrary means, rei over the whole land. A constant apprehension of change anarchy and confusion pervades the mass of society; and frequent recurrence hitherto of such a condition of things aff every department of industry by the mistrust and want of co dence in the stability of property thereby engendered.†

(To be continued in our next Number.)

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* *Rural Economy*, &c.

† In speaking of the last changes in the political condition of France, M. Lave makes the following remarks: "During the last five years (1848 to 1853) we been experiencing a state of things not unlike what took place in France a England between 1790 and 1800. This period has been distressingly barre results to us, but largely productive for them. *While we were vociferously ounding a multitude of questions, without settling any of them, they were q working out theirs; and now, both come forth from the trial, we weakened and trengthened.* The responsibility of the imperfect state of our agriculture doe attach altogether to our cultivators; its ulterior progress depends not sol hem, or rather it is not by fixing their attention on the soil that they wi ltogether able to avail themselves of the phenomena there presented; b ndeavouring to rise again to the general laws which govern the economic lopment of communities."—*Rural Economy*, &c., p. 91.

THE PHYSICAL CONDITION OF THE PEOPLE: THE RURAL LABOURER.*

A RECENT letter regarding that forlorn hope of modern evangelism, the Mission to Patagonia, informs us that the missionaries have found a friend in a certain intelligent native, "Jemmy Button," whose opinion of us, it seems, is not quite complimentary, though discriminating enough for a savage. "England very good —too much people—too many die—too much talk—too much noise." It may be too much to expect that Master Button's common sense should have kept him from falling into what *we* deem the Malthusian heresy of over-population; we therefore readily condone that offence because of the Registrar-General-like brevity of the Patagonian sentiment, "too many die—too much talk"—"vocables and eloquent wind," as saith Mr Carlyle. Yes, the "unnatural" deaths—the "mortality from preventable causes"—the physical degeneracy, the mental imbecility, the needless drain upon the national resources because "too many die," strike the savage mind with wonder. We quietly talk about them, while the untiring reaper Death is yearly mowing down his ever-multiplying harvest alike of old and young. We write this in the vicinity of a manufacturing town, with a population of 17,000 souls, unprovided with water, with drains utterly inadequate, and annoyed by a scanty stream, fetid and lukewarm even in winter, owing to steam introduced from mills, and where at this moment fever is committing frightful ravages. And *there*, as stated by our Patagonian censor, "too much talk" and nothing done, though it is two years since we were solicited for information in regard to the means of removing such serious evils.

We have no desire to nauseate our readers by the repetition of those shocking details as to the physical condition of the people in town and country, given in our former contributions to this Journal. We have dwelt with painful particularity on the calamities induced by scanty fare, deficient clothing, and damp, straitened, filthy dwellings. We have dispelled, we hope, the foolish fancy that because the country is not so unhealthy as the town there is no room for amendment in rural life.

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* *Healthy Homes, and How to Make Them.* Dedicated, by permission, to the Right Honourable Lord Palmerston. By W. BARDWELL, Architect.

Meliora: or, Better Times to Come: being the Contributions of many Men touching the present State and Prospects of Society. Edited by VISCOUNT INGESTRE. First and Second Series.

Fourth Annual Report of the Association for Promoting Improvement in the Dwellings and Condition of Agricultural Labourers in Scotland—1858. Six large Sheets of Working Drawings of Agricultural Labourers' Dwellings, with detailed Schedules of Measurement and Specifications. By J. C. WALKER, Architect to the Association.

In the hope of helping to attract atten to matters of th deepest interest we resume our pen, and pr d to redeem th pledge thus made in a previous article :—"In a concluding pape we shall treat of the wives and daughters of rural labourers, an endeavour to demonstrate that the number of illegitimate childre in the rural parishes of Scotland, about which there is at prese such an outcry, is the natural result of those evils which we hav been describing. We shall also direct attention to various rece efforts and suggestions for the amelioration of our rural populatio.

The wives and daughters of Scottish rural labourers have thei full share of the physical discomforts too common in rural dwel ings. The ploughman and the general labourer, though annoye and injured in body and in mind by exposure to such domesti miseries, can escape from them during the greater portion c almost every day. But their poor wives and children suffer fro them without intermission, and their sufferings are much aggr vated by their being very generally accustomed to weave. Th spinning-wheel, so common in cottages of the olden time, gav most useful employment to women. Its products afforded many "wiselike bonnie sark"—none of your trumpery cheap trash, bu fit for many a day's tear and wear at kirk and market. The nimbl fingers of maidens, looking forward to matrimony, accumulate stores of "plenishin"—prominent among which were the brid sheets and the bridal shift; while "the auld wife by the fire" wa gravely busy with the manufacture of her own shroud. As a this was for themselves, their time was at their own disposal. The could stop, when they chose, to tidy up, or have a little "wee timed daffin." The spinning-wheel and the reel were easily stowe away. But now they work for an employer in some, perhap distant town or village, and the web must be finished within certain time. And so, well or ill, they work away early and late and in Forfarshire it is a common sight to see the ploughman's wi or daughter trundling a heavy web on a lumbering wheelbarro to the distance of three or four miles. The inconveniences arisi from the narrow dimensions of the rural labourer's house are deplo ably aggravated by the introduction of a machine so bulky as tl loom. Unlike the spinning-wheel it is a fixture, and occupies tl greater part of one room in a dwelling which in general contai only two small apartments. Our readers may easily fancy wh "a muddle" things are in in such a house. Coal, whin, a room in one corner, potatoes in another, or below the bed; tl pig's meat steaming in a big pot near the door, and smelling vile; batter-tub for the web increasing the stench by a distinctly-pe ceptible sourness; dust and web-stuff everywhere, especially ne hair of "the gudewife and the lassies." Such, we know, is t ften the scene which meets the eye and offends the nose of t ... the rural labourer's dwelling. When it is damp, matt

are unbearably and shamefully bad. We have seen a female weaver, in the parish where we are now writing, so incommoded by water that "the treddle-hole" was actually almost full of it, so that her feet were only about an inch above the surface of the pool! It is evidently high time that the family comforts of the rural population were sedulously attended to. From cottages both town and country receive their chief supply of female servants, of whose growing worthlessness we are hearing such loud complaints. How can we expect it to be otherwise? We admit into our well-ordered dwellings girls from houses such as we have described, in which dirt, discomfort, and absence of womanly propriety are inevitable. And yet we are foolish enough to be surprised at finding them, too frequently, wasteful, witless, and wanton.

We take the poor things out of ill nests, and are amazed to find that they are not harmless as doves. We part with them, when, after long years of patient training, they are to be married, and flatter ourselves that, thanks to our teaching, they will turn out mothers of a regenerated race. Ten years afterwards we visit our once comely and tidy servant, expecting to find her all our fancy painted her. She is the mother of six children very likely, whom she misguides shockingly—in the old-fashioned strike and scold, "*I'll gar ye do't*" style; the house is in confusion, and she is evidently an ill manager. Why? Listen, ye maid-servant-abusing matrons! You took her, an ill-brought-up girl, out of an unhealthy and improperly-constructed cottage; you send her back a matron to one not better. For a while she strives to maintain the proprieties witnessed in your houses; but sickness, straitened circumstances, straitened room in which to cook and wash, and bring up children, soon rub off your pretty polish, and make your former handmaiden relapse into her former self, the veritable image of her own "*throughither mither*," of "*canna-be-fashed*" memory.

Such, we believe, is something like a true history of many a country girl who has been a domestic servant in a non-agricultural family. Let us now look at rural matrons and damsels engaged in the operations of agriculture.

It is no doubt an evil that children, girls as well as boys, should be prematurely taken from school, in order that their little earnings may swell the scanty revenue of the rural labourer's family. When treating of the remedy for the evils of which we have been writing, we shall point out how this grievance may be diminished. At present we have only to observe, in reference to the physical condition of the people, that the employment of children in the operations of agriculture is desirable on many accounts, and that the health and vigour of those so employed contrast most favourably with the puny offspring of many kinds of town labourers.

The evidence in regard to the effects of outdoor labour on the health of women is also almost unanimously favourable. A medi-

cal witness asserts:—"We have found much more disease in women of sedentary habits of the same class, such as those employed in button-making and household service. Where women have no outdoor exercise, chlorosis, constipation and indigestion occur, which are very uncommon with women who labour in the fields. Women who labour in the fields, like men, are exposed to rheumatism and catarrhs. But, generally, outdoor employment is extremely conducive to regular habits of body in women; and from the want of such regularity, women of the same class of life in towns, or at service, and who do not work out of doors, suffer a great deal."

Certainly this is quite in harmony with our personal experience. Many an old woman in the country has assured us that till the coming on of her last illness she "never swallowed a bawbee's worth o' pheesic a' her days;" and in consequence, we have experienced the greatest difficulty in persuading them to taste what they scandalise us by terming "thae doctors' dirt." We are therefore of opinion that the following remarks are either not generally applicable, or that they are somewhat too highly coloured by generous indignation, occasioned by the unhappy personal experience of the writer.

"With the exception of the factory girls and needlewomen, I know of no class in our country that has more need of public sympathy, and receives less of it, than female farm-servants. In saying so, I do not wish to be understood as implying that, without exception, the condition of these servants is very bad; I am well aware that on many farms their comfort and welfare are strictly attended to; but I am equally well aware that there are too many farms where the treatment experienced by this useful class is very far from being creditable. To throw a little light on this subject may not be unproductive of some good."

In the hope that it may, we invite agriculturalists to meditate on the following statements by a working man, whose field of observation, we believe, is Perthshire: "On most farms where two or more servants are kept, one of them is generally engaged to act as housemaid, her duty being to attend to indoor matters; and the others are engaged to work on the farm—that is, to labour at almost anything the men are employed at, with the exception of holding the plough. These latter work on the dunghill, at filling, mixing, and spreading in the field; in the thrashing-mill, in loosing, riddling, or bundling straw; besides, they drive carts, roller, and brake, or pull and cart turnips in all sorts of weather in the winter time; and on farms where only one is kept, she must try her hand at all kinds of labour, outside as well as inside. In addition to this, her work is never done. The men have something like hours for their toil, but the females have nothing of the kind; they must rise with the lark and be the last in going to bed, and be at the

all of every one." Then comes an episode in rural life, the sad history of sprightly Jeanie Davidson, and very well told it is; how she, the pride of her mother, and the admired of all for her light-hearted honesty, died from consumption induced by exposure on a winter's day; and how the heart-broken and widowed mother soon crept into the grave beside her daughter.

We trust that such labour as the writer of *The Clodpole* thus describes as commonly performed by women in the district with which he is familiar, is unknown in the greater part of Scotland. To witness a hired woman working on the dunghill must be a rare sight. We have, however, seen the wife of a small farmer so employed. It may not be easy precisely to define the woman's province in agricultural labour, but reasonable people will sedulously guard her from whatever degrades her morally or physically. "In France, I regret to say," observes Martin Doyle, "women sometimes assist in yoking, unharnessing, and grooming the horses which draw the coaches in the provincial parts of the kingdom; and female peasants flounder knee-deep in half-liquid manure, filling and emptying dung-carts, or going to and from the stables and cow-houses. There 'the fair sex' also may be seen imbruing their hands in the blood of sheep and swine, and assisting their husbands in all the horrid operations of the shambles."

The diminished numbers of the male population mercilessly slaughtered during the wars of Napoleon, and the very large proportion of men still compelled to enter the army, have doubtless retarded the agricultural prosperity of France, and necessitated the employment of women in drudgery the most coarse and unfitting; and we pray those interested in the physical wellbeing of the people to mark the result. Hard work and constant exposure to the weather make sad ravages on the face and figure of the French peasant-woman; while the constant drain upon the vigorous men of the Empire to supply the demands of the army has evidently affected the physical type of a large portion of the nation; and thus, though only of medium height ourselves, we have been able to look down upon a whole regiment of the French line! As matters go in this evil generation there must be wars, we suppose; and woman, too, must work in the fields till the coming of the, we fear, far-distant time when she shall be able to take St Paul's advice—"That the younger women marry, guide the house, bear children." Poverty often compels her to work in the fields, and to leave a sucking infant at home under the charge of a thoughtless child; and often do we see the poor infant suffering grievously from such neglect. Not rarely, too, we see infants taken to the field, and there laid by a dyke-side, to which the toiling mother occasionally repairs for the purpose of imparting the unwholesome nourishment afforded by her fevered breast. Of course, when imperative necessity demands it, this must be submitted to; but for

a well-paid ploughman's wife thus to treat [illegible]ly for the mere sake of a few miserable shillings, is a shame, [illegible] a shortsighted blunder. His home is uncomfortable, his neglected children fall ill, and their pining faces reproach the mother's folly, while the doctor empties her purse of her ill-gained pennies.

Although, in such a case as this, decidedly opposed to the employment of females in agricultural labour, we cannot say that we are prepared to chime in with the sentimental fancies of those who would have us believe that female outworkers are a rough immoral set, in consequence of their out-of-door labours. We question much whether the weaver-girls in the neighbouring county town are more refined or more virtuous than the hardy countrywomen and girls who labour much in the fields.

Mr Austin, we think, declares very truly—"There are no very apparent effects upon the morality of women from their working in the fields; very frequently they are active, energetic, and well-disposed women, working from the sole desire of increasing the means of subsistence of the family, and personally undergoing the labour of their employment for that object. Their motive being thus meritorious, is hardly consistent with any great degree of immorality." Yes, if our hard-working peasant woman do fall into temptation and a snare, she is a very different person from your saucy town minx, whose sin is not associated with anything so respectable as severe toil for the increase of her parents' scanty means, but springs too often from sloth and ungoverned sensuality. Moreover, we avow the conviction that the comparisons recently instituted between the morality of the country and the town, and so much to the disparagement of the former, are not so fair and so conclusive against rural virtue as they appear to be to those who look no farther than to the per-centage of illegitimate births as recorded by the Registrar-General. We admit the accuracy of that able functionary's statistical tables; nevertheless we maintain that the greater amount of bastardy attributed to the rural districts is an argument against the superior purity of the towns! We are sorry to be obliged to write of things not fit for ears polite; but "our great social evil" can no longer be covered by the veil of unreflecting charity, or of dangerous modesty. And happily public opinion is now turned in this direction; journalists discuss it with earnestness; and Mr Acton had the courage, at the first meeting of the Social Science Association, to read a remarkable paper on Prostitution. Seeing that Scotland, and especially its rural districts, figures prominently in these discussions, we trust our readers will hold us excused for taking part in the elucidation of matters so painfully interesting to dwellers in the country.

We return, then, to our assertion, that the greater number of [illegible] in our rural districts, however significant as to the lack [illegible] chastity, is by no means demonstrative of the superior

purity of urban morals. On this point we are glad to be corroborated by Sir B. C. Brodie, who, in his address on Social Economy, at the first meeting of the Social Science Association, thus expressed his sentiments: "The same care to look beyond the thing immediately before us is necessary if we would inquire into the condition of society, and the nature and extent of the other evils with which it is infested. Thus I find, by referring to the Registrar-General's reports, that the illegitimate births registered in London are in a smaller proportion to the legitimate births than in any other part of the kingdom. In one year, while the illegitimate births in London were only 3.2 in 100, in Derbyshire they were as 8.3, and in the North Riding of Yorkshire they were actually as 9 in 100. With these facts before us, we might say how remarkable it is that, in this respect, London should afford so much better an example as to morality than other places. But, with a little consideration, the wonder vanishes, and we find too good reason to believe that the apparently greater morality is to be traced to something very different from greater virtue in the metropolitan population."

We have no wish to deny or palliate the amount of rural immorality. We only contend that bare statistics stultify and mislead our civic censors, when, pointing to them, they wax virtuously wrathful against the superabounding wickedness of rural life. When silencing them by an appeal to such urban enormities as fester amid the low population of crowded cities, we are aware that this *argumentum ad verecundiam* too much resembles the taunt of the sweep against the collier to be quite satisfactory. We frankly confess that to blacken the town won't purify the country, and that two blacks will never make one white. Still we wish to reduce our rural misdoings to the dimensions of truth: only with this view do we invite our readers to meditate on what we have written, and on what we are about to write.

Upon the whole, then, we conclude that the town cannot boast over the country in reference to the relations between the sexes; and we are fortified in this persuasion by what we read in the Registrar-General's third quarterly return ending 30th September 1858. The illegitimate births in the town districts of Scotland were in the proportion of 1 illegitimate in every 11.9 births, while in the country they were in the proportion of 1 illegitimate in every 10.1 births. This difference may be readily explained by a few remarks upon the causes of the excess of illegitimate births in the rural districts of Scotland. The Reports of the Registrar-General first proclaimed that these districts were more immoral than the town, and that Scotland was more immoral than England; and in these reports we also find, we think, the explanation of these social discrepancies between town and country, as well as between

North and South Britain. In the supplement to the quarterly returns for 1857, we are informed that "marriage was contracted in the town districts in the proportion of 1 marriage in every 125 persons; whilst in the rural districts it was only contracted in the proportion of 1 marriage in every 171 persons." "Over all Scotland the proportion was 1 marriage to every 143 persons—a proportion somewhat higher than during any year since the Registration Act came into operation. Even this proportion, however, is greatly inferior to that which occurs in England, seeing that a ten years' average shows that in England marriage is contracted in the proportion of 84 marriages to every 10,000 persons of the estimated population. This fact, taken in connection with the circumstance that the births in Scotland rather exceed than fall short of the English proportion —while the returns, in so far as yet received, show the number of illegitimate births to be greater—would seem to indicate that some causes are in operation in this part of the kingdom, more especially in certain localities, which are not favourable to the morals of the population." And in the quarterly return dated 30th September 1858, we find it recorded that marriages in the Scottish towns were in the proportion of 1 in every 148 persons, while in the rural districts there was only 1 marriage in every 271 persons. So, then, in the country as compared with the town, and in Scotland as compared with England, there is an abnormal forgetfulness that "marriage is honourable in all;" and, as the natural result, there is a woeful contempt for "the bed undefiled." If men and women will despise the wise restraint which Christianity imposes upon their passions, or if a peculiar state of society give undue encouragement to celibacy—if Scottish agriculture be chiefly conducted by unmarried men living in bothies—if the number of houses fit for married men be unduly limited, so that the families of ploughmen often live in towns and villages, while they themselves are doomed to the discomfort and the demoralising influence of the bothy—we have in these things one chief source of those rural immoralities of which we hear so much. These things do exist among us, and to such an extent as to demand the serious attention of all interested in Scottish agriculture.

In a very large proportion of our rural parishes the number of houses is insufficient; so that persons desirous to marry must migrate, unless lucky enough to secure the house of some one leaving the parish. Being ourselves anti-Malthusian both in principle and practice, we have no sympathy with those who would deny our ploughmen "the luxury of marriage." At the age of 25, a ploughman is as well off as he is ever likely to be; and if circumstances, over which he has no control, hinder his marrying in his lusty prime, he is tolerably certain to do something worse—to show, in fact, his contempt for Malthus in an illegitimate fashion, which shall cause his doings to be chronicled in the records of the kirk-

session. All our experience proves that discouragements to matrimony infallibly injure the character of the rural community. And of the good resulting from matrimony a clergyman thus forcibly writes to us: "I am amazed that young people, after having run a course of immorality which anywhere but in the country would have given them the character of hopeless reprobates, should all at once settle down into such decent members of society as soon as they enter on the married state."

If in England the agricultural labourer be more frequently married than we find him in Scotland, and if to this difference be attributable the excess of Scottish immorality, it is too evident that in both countries the peasantry afford sad illustrations of "the influence of habitation on the community." A paper with this title was read before the first meeting of the Social Science Association, by the Mayor of Swansea, W. H. Michael, M.R.C.S., who observes: "As the mind leaves in the human face indelible traces of its workings, so the stamp of insalubrity reacts on a whole population, and defaces the true nobility of their countenances. But there are direr moral results which are inseparably connected with overcrowding. To what is to be attributed the frightful increase of prostitution, especially in young children of twelve or thirteen years of age? However dreadful the conclusion may be, I am led, from experience, to believe that this commences among families themselves, and that the necessary mixing of the sexes—sleeping together in the same room, and often in the same bed—breaks down the barriers of female modesty and decency."

The Duke of Buccleuch, looking at this matter from a different point of view, very wisely observed, at a public meeting in Edinburgh: "We must consider the effect this has on the moral condition of our peasantry. Many of them are very well educated, and some of them have considerable natural refinement of mind; but really when a man has a feeling of refinement and is well educated, if he lives in a house that any person might hesitate to put his pigs in, you cannot expect that he can be otherwise than discontented with his lot." We can testify that labourers bitterly complain that they are not duly cared for by their employers, and that some of them, at least, dread the evil consequences of over-crowding upon the youthful members of their families. We are in possession of shocking details of the mischiefs occasioned by the indecent huddling together of the peasantry in their straitened dwellings; but they are so revolting that we cannot dwell upon them. We content ourselves with reiterating, that healthy homes for the people is the crying want of our times, and that until these are provided, we can only anticipate that the working classes shall become more and more unhappy and degraded. The moral and the physical act and react, the one upon the other; and while it is most true that no improvement in external decency will purify the heart, it

is no less true that the heart will become more callous and embruted when the eye daily rests on every variety of sordid misery. Let, then, our philanthropic improvers of the dwellings of the peasantry bear in mind, that drunkenness and want of chastity will not be less common in commodious houses than they are now in overcrowded hovels, unless their inmates be taught self-respect by being awakened to a sense of the blessed relationships by which God wills that they shall be knit together as husbands and wives, parents and children, brothers and sisters; and, therefore, instead of shouting with the French socialists, "Down with family" (*à bas la famille*), the efforts of the Christian benefactor of the labouring man should be to give him *a home*, and to strengthen to the utmost *the family bond*. Each well-regulated *home* is a barrier to the progress of social evils more effectual than the wit of man has ever been able to devise; and all attempts to regenerate society by organising it into communities in which the individual family is lost sight of, will only end in the shame of its contrivers, and in new calamities to those they have duped.

> "What makes the fireside a happy clime
> To weans and wife,
> That's the true pathos and sublime
> O' human life."

It is under this conviction that we direct attention to the several works indicated at the head of this article; in each of which there will be found much that may be useful to those seeking to counteract those physical and moral influences which have so injuriously affected the working classes, alike in town and country.

Healthy Homes, and How to Make them, by Mr Bardwell, originated in the benevolence of Miss Burdett Coutts, who was dissatisfied with what are usually reckoned the requisites of a working man's urban home. Although Mr Bardwell's book be chiefly occupied with the requirements of the town labourer's house, it also contains much that is applicable to houses in the country. Our readers will find plates and descriptions of the cottages of the Labourers' Friend Society, a pair of which cost £115, being probably the cheapest things of the kind ever built. There is also a plate and description of the model cottages of the same Society; they have three rooms; and, observes the late Mr Loudon, "considering the size of the rooms, these dwellings are certainly remarkably cheap. They may, indeed, justly be considered elegant, from the well-proportioned openings, the pedimented ends, the low pitch of the roofs, and the Doric simplicity of their general [illegible]n."

[illegible]r Bardwell strenuously advocates the use of tubular bricks in [illegible]ter walls, in preference to solid—over which they have these [illegible]vantages,—they are less conductors of heat, cold, dampness, and [illegible] buildings made of them are warmer in winter, cooler

in summer, and always drier." We should like to know whether any of our cottage improvers have tried Norton and Borie's "patent tubular tiles," which are said to possess many advantages over the old plain tile, the pan tile, or slates. As they are non-conductors of heat, the sun's rays on a roof of these tiles has little, if any, power beyond the outer surface, the heat "being cut off by the presence of air in the tubes running all through the tile." The various practices so frequently adopted with a view to keeping down the temperature of the uppermost rooms in all sorts of buildings, are now unnecessary, these tiles, it is asserted, meeting every want. They are also efficient ventilators; by using those with the tubes left open, the air is admitted in the safest manner, running upwards in the same direction with the roof. In many particulars, Mr Bardwell's suggestions coincide with those of the Association for Promoting Improvement in the Dwellings and Condition of Agricultural Labourers in Scotland, of the possible cessation of whose labours we have heard with regret and surprise also, as we were not aware that its duration was, at the time of its institution, declared to be only temporary. It has done a great deal of good, and may do much more, for really its suggestions are only beginning to be known; its improved cottage-requisites are as yet not in anything like general use. The latter we lately inspected, and we must say that the different kinds of cottage grates, exhibited in the offices of the Association, are the cheapest we have seen—jambs and lintel grates, all in one solid piece of fire-clay, at 11s., and a fire-clay hearth for 5s., are admirably fitted to add to the comfort of cottages, and dispel the damp, dread of which is often the reason of the spare room being unoccupied during the winter, and of the entire family of the labourer being indecently and insalubriously huddled together in the kitchen. It is not easy to break them off from such habits; and therefore, when our cottage improvers abuse the peasantry for not using the additional accommodation provided for them, they should remember this, and have patience. Moreover, if the additional apartment be in the shape of a "mid-room" (deservedly discarded in the most recent plans of the Association), we must say we sympathise with the reluctance to take possession of such a dismal sunless apartment. An effectual remedy for the unwillingness to sleep elsewhere than in the kitchen will be the gift of a ton of coal, to be consumed during the winter in the spare room in warding off damp; or, better still, let the kitchen grate be so constructed as to heat two apartments. This device is specially deserving of adoption, because it *ventilates* as well as heats. The way of doing this, and many things else of great consequence to health and economy of fuel, is so amply detailed in Mr Scott Burn's *Agricultural Architecture and Engineering*, published in this Journal, January 1852, that we content ourselves with advising that they should be carefully studied. This matter of ventilation,

of sleeping apartments in particular, is literally of vital importance. For example, in the Dublin Lying-in Hospital, of 7650 children born within a certain period, 2944 died within fourteen days of their birth; but on the hospital being ventilated, the mortality fell to a proportion which proved that 2000 of these children had died in consequence of the poisoned air of the hospital. Again, in a certain building in Glasgow, called the Barracks, and inhabited by about 500 poor Irish, there occurred in two months 57 cases of typhus fever, but after being ventilated by Mr Fleming, a surgeon, there were only four cases of this fever during the following eight years. The method consisted in carrying a tube, one and a-half inch diameter, from the corner of the ceiling of each room into leading pipes, terminating in the chimney-stalk of a neighbouring factory. Following out this idea, Dr Wyld proposes that all dwelling-houses shall be ventilated by means of the kitchen-fire. The idea is most happy, and being of easy execution, Dr Wyld, very reasonably in our opinion, insists that the Legislature shall resolve that no house be built without provision being made for its thorough ventilation. The other day we were in a "model bothy" ventilated in this way: the bedrooms were said to be cold, but the dwelling was so superior to what they had been accustomed to, that we found the bothy occupied almost wholly by married men, one of whom said he had never been in a bothy before, and averred that the superior nature of the accommodation was the reason of his being there.

This case of married men leaving their families in the neighbouring town, and becoming the inmates of a bothy, is by no means rare, we are sorry to say. Nothing can be more destructive to the wellbeing of a labourer's family; and we are confident that those desirous of turning model bothies to their proper use, will take care that they be not perverted into new temptations to married men to live apart from their families.

We desire to see more of such bothies, and we speak from experience when declaring that their benefits are appreciated by agricultural labourers, and that they do not wantonly abuse them. There is, we are persuaded, very little ground for the assertion of non-improving farmers—that it is of no use to give their men better accommodation, because they are sure to destroy it. They may be a little rough for a time, till they become accustomed to the proprieties of civilised ways of living: this will disappear ere long, and our ploughmen will no more think of smashing the bothy furniture for firewood than will our cooks of burning the kitchen dresser.

In like manner with mental refinement and capacity for enjoying the pleasures of reading;—we cannot soon expect that these shall be exhibited by the long-neglected rural labourer. His philanthropic friends must have patience with him, and not expect

him forthwith to declare with Cicero, "*Vita sine literis mors est;*" or, to say in English—

> "Books, we know,
> Are a substantial world, both pure and good;
> Round these, with tendrils strong as flesh and blood,
> Our pastime and our happiness will grow."

We know of a worthy farmer much disheartened in his efforts to improve his servants by the following incident: Having furnished them with books, he was one day annoyed at finding one of them on the bothy floor, and none the better for such usage, of course. Picking it up and remonstrating with them, he was listened to in silence; but as he retired, his quick ear overheard the remark—"Confound the *fallow,* does he expect us to work his *wark* and read his books too?" In *The Book of the Farm* we read what should lower our expectation of the farm-labourer reading much during a large portion of the year. "It is a common remark by townspeople that farmers, as a class, are averse to reading. If they knew the habits of farmers as well as I do, the observation, even if strictly true, would be no obloquy. Little do townspeople know the weight of fatigue which early rising and constant exercise in the fields on foot—which the farmer is obliged to take in summer who has improving operations to superintend—impose, and of the lassitude which overtakes the frame when resting in the evening after the fatigues of the day. It is then physically impossible for any man to betake himself to reading a subject that requires thought and reflection, or any subject at all. The desultory newspaper affords the most fitting literature to his mind until the hour for bed, which must be early. No one has a higher relish for reading than myself, and yet I have seen a whole summer slip away without having read anything but the newspapers." Winter, therefore, is the farmer's reading-time, and so is it also with his men; and that they read, think, and write for the press sometimes, we have the means of knowing. We have now on our table a prize essay on "The Grievances of Ploughmen, and their Remedies," by a working Strathmore Ploughman. His name is Peters, grieve to W. Collins Wood, Esq. of Keithock. Very creditable it is as a literary composition, as well as for the good sense and right feeling by which it is pervaded. As a specimen of how a ploughman thinks and writes, we give the following extract: "I think that masters could do a good deal to impart education to us, if, when they engaged their servants, they would inquire something about the education they have received, and not buy them as they would do a horse or a cow, merely looking if they have good teeth, and clean bones, arms, and legs. Let them get an intelligent man or two into the bothy; let them give them their newspaper after they have read it themselves, and you will be

surprised what a difference it will make—every one will take an interest in it, and those who can't read will listen eagerly.

"The next thing I would say is, that ministers ought to pay more attention to our class than they do. Let them come into our bothies and talk with us, rough-like though these bothies be, and rude like ourselves; let them inquire kindly into our several conditions and circumstances; let them show us that they take an interest in our welfare, and then (if there are no higher motive) our self-esteem will keep us from sinking into moral degradation.

"Another thing which tends greatly to improve our condition, mentally and physically, is railway excursions. We are whirled away to places we never dreamed of; we see men working in coal-pits, at canals, in quarries, at foundries, gas-works, manufactories, &c., most of them at harder, dirtier, and more disagreeable work than that of which we complain; sailors exposed to rougher weather and wetter skins; soldiers whose term of bondage is longer than ours; all which tends to raise our minds above the cares and imaginary evils of our profession, shows us things in their real light, and makes us feel that we are not so badly off as we thought—in short, we come home happier men, and more satisfied with our condition in life."

It is something new to find the working classes able thus calmly to discuss the evils of their social state. Lord Ingestre, in *Meliora, or Better Times to Come*, was the first, so far as we know, to invite them to take part in such discussions, and to publish *Leaves from the Lives and Opinions of Working Men*, by Themselves. Without this co-operation of thinkers and workers we shall never know how to deal with the social problems which so urgently demand to be considered; we must be familiar with what labouring men *think* before we can comprehend their position, and aid their efforts to extricate themselves from its disadvantages. As to the danger to be apprehended from working men publishing opinions detrimental to the welfare of society, it is sufficient to reply that such opinions cannot be counteracted until their existence is known; and therefore we think that the editor of "Meliora," and the editors of certain newspapers, judge rightly in inviting the working classes to discuss their grievances and to suggest the remedies. For example, the Strathmore Ploughman furnishes us with a reason why we should instruct grown-up lads in the bothy by means of an itinerant teacher, or "fleein' dominie," as they call him, rather than by encouraging them to go to a common school during winter. "I have seen," says he, "young lads, after they had served a year or two with the farmers, come home a winter to the school, but they generally did very little good at it: they found they were far behind the rest of the scholars, even the very children were ahead of them—[illegible] longed to be back to the

:hy again, where they would not be laughed at for their igno- ıce, and where no one would interfere with them concerning ıir education." Therefore, as the most ignorant of our plough- n will not come to the school, the teacher must go to the bothy :ing the winter evenings, by some arrangement such as that ›pted by Lord Kinnaird, who employs a young man to give in- uction in reading and writing.

But the difficulty of introducing education into the bothy should met in a different manner—namely, by giving a *suitable* edu- ion to our future ploughmen while they are boys. We place phasis on *suitable*, because of opinion that the education com- nly given in rural districts is not sufficiently conducted with erence to the peculiar circumstances of those receiving it. The ool-books are the same as those employed in town schools: we iderate, and have often thought of compiling rural reading- ›ks profusely illustrated, and bearing directly on matters most eresting to a rural community. Such books in our cottages ght educate both old and young, and be most advantageously ıstituted for certain philosophical school-books much in vogue, : so much beyond the comprehension of rustics that a country man said to us of one of them, "It's a maist fine book, the rds are sae lang; but I dinna understand a deal o't." We want ool-books, not in learned English, but in such English as was d by Cobbett, and, as already said, about matters especially in- esting to dwellers in the country. We are persuaded that they uld be very popular in the town also. The topics might em- ce elucidations of a vast variety of natural phenomena—such as seasons, frost, snow, rain, thunder, the atmosphere; and of ural objects, such as mountains, lakes, rivers, seas; of ani- ted creatures, such as all the domestic animals, and the mode caring for them in health and disease; the most useful vege- le products, those of our own country in particular; the dif- ent kinds of soil, and their relative values; the elements of chanics, with special reference to farm implements. We think pters on how to keep a pony, rear rabbits, and manage bees, ıld be more interesting to country boys than very much of the :alled useful knowledge attempted to be conveyed to them in ny school-books. As for the girls, we should interest and in- ıct them also with reference to their future position as mothers domestic servants. In most country schools the girls receive ctly the same education as the boys; no provision is made for ructing them in household economy and needlework. A ale teacher is therefore indispensable in every parish; and to her verbal instructions she should have school-books something he style of the *Reading Book for Girls*, published by the Com- sioners of National Education in Ireland, but much more prac- l. If at school our country girls were trained to gentleness and

propriety of manners by a female teacher, who should also instruct them how to shape and make clothes, besides making them duly aware of the worth of fresh air, cleanliness and economy in the preparation of food, and the use of fuel, the result would infallibly be most beneficial.

All such attempts at improved instruction in country schools must be accompanied by industrial training, which, if possible, should be remunerating to the children, with the view of counteracting the mischief caused by their being too soon removed from school in order to labour for their own support. Successful experiments in many parts of England and Ireland, and in a few instances in Scotland, have demonstrated that a great deal of knowledge in farming and gardening may be communicated to children when there is attached to the school a piece of land for a farm or garden. The profit to the children in the shape of money is also so considerable as to enable them to continue at school until fit to engage in regular labour. We have always been struck with the waste of time in our country schools. It is impossible that children can be profitably occupied with intellectual labour from nine to five o'clock, with the intermission of an hour for dinner. They become listless; and we have long been confident that the same amount of knowledge might be communicated in half the time, if judiciously varied by the introduction of manual labour. We are now possessed of information demonstrating that such is the fact. An English teacher thus writes to one of her Majesty's Inspectors of Schools regarding the effects of a school-garden upon his pupils: —"They are very industrious, and seem to be lost without something to do. They work cheerfully, and always seem cheerful and happy. It animates and enlivens them, makes them fond of their school and teachers, and causes them to be very curious and inquiring upon things connected with natural philosophy. It promotes order and obedience, and causes them to be more particular in regard to personal cleanliness. I would much rather teach the boys, when fresh and animated from the garden, than when hot and excited from the playground." Another English teacher reports that the average profit of a school-garden is about 12s. to each pupil. For the encouragement of those desirous of trying the effect of school-gardens, we direct attention to this statement by the parochial teacher of Eyemouth in Berwickshire: "The best scholars appear to be the best gardeners; and those whom I find most frequently at work in cultivating their gardens, I invariably find to be the most diligent in school. The boys are encouraged to consult together, and to ask advice from their friends as to what and when they should sow, but each plans his own cropping, and does the work himself: thus habits of observation and management are acquired. The garden accounts, which each boy keeps, being records of actual transactions in which he engages, form an

ellent preparative for book-keeping on a large scale." It is ortant to add that the profit from this school-garden was at the of £19 per acre.

)r Kirkpatrick, in a Report to the Commissioners of National ication in Ireland, estimates that on a school-farm " a lad might, out impediment to his literary education, earn nearly 30s. ear; and if his parents could afford to invest this in the purchase pig, a lamb, or a calf, which might be reared for his benefit, he ing for its maintenance with his future earnings, selling it at proper time, investing the proceeds in additional young stock, thus from year to year adding to his little property, what a able step this would be towards improving the provident its of the humbler classes!" The Rev. T. P. Norris, one of her esty's Inspectors of Schools in England, approves of the system ultivating land by schoolboys, under certain conditions, "as the way in which a school can hope to become self-supporting in all country parish." Having perused the suggestions made at meeting of the Association for Promoting Social Science, with view of devising a remedy for the growing evil of brief attend- at school, we think none of them can compare in point of ty with those which counsel the adoption of school farms and lens.

mong remedial suggestions for elevating the rural labourer, should here naturally point out the benefit he derives from g the owner or occupant of a piece of land sufficiently large nable him to keep a cow. But on this part of our subject we not enter, owing to its having been recently treated of in this rnal, in several articles on the " Possession of Land as an Indus- Occupation for the People." Neither do we think it expedient to more regarding the moral and physical improvement anticipated 1 greater attention to household accommodation. We must, ever, express regret at certain recent circumstances calculated epress improvements in this direction. The first of these is the sion of the Court of Session, which, in the case of Mrs Murray llop, has declared that building houses for working men does constitute a permanent improvement for which an estate can burdened. The learned Judges have no doubt rightly inter- ed the law; but that the law in this particular is opposed to interests of society cannot be questioned by any one knowing effect upon the community of inadequate domestic accommoda- . We therefore hope that the Legislature will speedily remove unexpected obstacle to social progress.

he other circumstance to which we would allude is the appa- diminution in certain quarters of the only recently-exhibited for the improvement of the dwellings of agricultural labourers. notice that farmers are irritated by the way in which they are cen of in the public press, and that they have retaliated on their

censors by demanding to know what they do in rendering proper the houses of those they employ. The reply to this is obvious. It is no part of an editor's bargain with his printers that he shall provide them with houses, whereas the agriculturist does make such a compact with his servant, and every consideration influencing reasonable men should prompt him to fulfil it in a liberal spirit. Everybody nowadays is subject to the criticism of the press; and there is no way of escaping its censure except by being just and generous in our treatment of the labouring classes. And in order that our agricultural friends may not be caught napping, we think it right to warn them that they and their affairs are about to receive the special attention of "the best possible public instructor." "A chield" will soon be "amang them takin' notes," and that "he'll prent them" is certain. The *Poor Law Magazine* announces that it has appointed "a special commissioner, who will particularly inquire into the homes of the working poor—1. In large cities; 2. In towns; 3. In villages; 4. In the country, and bothy system."

Before dismissing the subject of dwellings for the people, we must correct a very general mistake as to the existing law upon this matter. There are many clamouring for legislation to put down those insalubrious indecencies of which we read so much. The fact is that we have a recent and very stringent law, abundantly adequate for the end proposed—we mean the Act for the Removal of Nuisances. But so little is it acted on, so little is it known, that having once publicly quoted it, we were met by the objection that it did not apply to the country. But that it does, and that it effectually provides against many of those evils of which we complain, admits of easy demonstration. The execution of the Act is committed to town-councils, "and the parochial board of a parish in any place over which the jurisdiction of a town-council does not extend." If words have meaning, this must comprehend rural parishes. And the sufficiency of the Act for the purposes contemplated must be allowed when we read, "The word 'nuisances' shall include any insufficiency of size, defect of structure, want of repairs, or other matter or circumstance rendering any inhabited house, building, or part thereof, unwholesome, or unfit for human habitation." Many other nuisances, such as are commonly indicated by their offensiveness to the public nose, are specified, and all are declared removable on a certificate from the medical officer, and application by the local authority to the sheriff. And should the local authority fail to carry out the Act, two householders, the procurator-fiscal, or the inspector of the poor, may complain to the sheriff. Moreover, the constabulary and police force, in their respective jurisdictions, shall aid the authorities and officers acting in execution of this Act. Here, then, not only all manner of dangerous filthiness in the abodes of man and beast, but all struc-

tural defects or disrepair, rendering human habitations unwholesome, are under the ban of British law. How comes it, then, that soldiers miserably perish in insalubrious hospitals and barracks, and that peasants and ploughmen are huddled together in a manner equally injurious to purity of mind and body? It is because the law is in advance of the public feeling among us; and it is with the view of rendering it more sensitive as to what is due to human beings that we have devoted so much attention to the physical condition of the people, and especially of the rural labourer. *He* claims our special attention, not only for his native worth and importance as one great source of our country's wealth and vigour, but also for his quiet endurance and little inclination to grumble at the evils of his condition. We speak for him who talks little and writes yet less about himself. From those who are more especially indebted to his integrity, laborious toil, and sagacious acquaintance with natural objects, we have a right to expect a growing appreciation of what is his due, and that they shall not grudge him the comfort of a healthy home, and all reasonable facilities for rearing a virtuous, an intelligent, and an industrious family.

HIRUDICULTURE * (Leech-culture).

This being a Journal devoted to the interests of rural economy, we reckon it a part of our duty to acquaint our readers with such foreign practices as deserve to be noticed either for their utility or their novelty. We have therefore recently dwelt upon the national advantages derivable from Pisciculture; and when asserting that our lakes and streams, either fishless, or tenanted only by worthless kinds of fish, may readily be made to teem with the noble salmon, and many valuable species of trout, we presume that the assertion was of interest to many of our readers. Lakes and rivers so stocked are manifestly of marketable value: the rearing of salmon artificially is an interesting process; the catching of them is the angler's pleasant pastime; the eating of them is a delight to all save the dyspeptical. Hence our articles upon the art of multiplying them have, we know, been read by farmers without a grumble because of the space abstracted from the discussion of matters purely agricultural.

But "Leeches," "Leech-culture,"—what have such matters to do with agriculture? Much in various ways, as we shall try to show,

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* *La Pisciculture et la Production des Sangsues.* Par Auguste Jourdier, avec une Introduction par M. Coste, de l'Institut. Paris: Hachette et Cie.

with the help of M. Jourdier. Col fortu s have been m by rearing leeches. The demand for t so ntly increasing both in this country and in France; and as this can be met by those possessing suitable rural localities, we are labouring within the special province of this Journal when directing attention to this singular and very remunerating branch of rural economy. Such is the demand for these creatures, that four only of the principal London dealers import about eight millions of leeches annually. The retail price used to be about threepence, but now it is six pence. In France the demand is also so much in excess of the supply, that the common price is from twenty-five to sixty-five sous at times; so that hospitals and charitable institutions are constrained, from economical considerations, to advise medical men to be sparing in the use of such a costly remedy.

This extending use of the leech is intimately connected with a blessed revolution in the practice of medicine. Within the memory of many of us, bleeding was freely resorted to with a most fool-hardy forgetfulness of the Mosaic sanitary declaration, "the life of all flesh is the blood thereof." Doctor Sangrado, immortalised in *Gil Blas*, is not a myth, but "a general practitioner," down to very recent times, and whose doings with his lancet were inconceivably mischievous. So widespread was the carelessness about the loss of precious blood that we are old enough to remember the time when female servants in towns were wont to have themselves bled every spring, although in the highest health—a senseless and debilitating custom, against which we have to remonstrate in this country to this day! But our doctors, like our legislators, being now much less sanguinary in their curative processes, the lancet is superseded by the leech, whose power of bloodletting fortunately does not extend *ad deliqium animi*—the fainting of the patient from loss of blood—the point barbarously aimed at by doctors of the Sangrado school.

Cupping, too, has of late got into disuse. Hence the growing demand for leeches. Hence having, in the extension of pisciculture, found grateful food for the healthy, the benevolent M. Jourdier feels called upon, in the name of the general wellbeing, and in the name of the sick poor, to demand that leeches shall be reared and multiplied. The propriety of the demand is evident enough; and that it can be complied with, most beneficially to those who rear them at all events, is demonstrated by a variety of curious details. We shall abstract and translate, so as to give our readers the benefits of his singular information.

Leeches belong to the class *Apodes* of Blainville, and *annelides* of Lamarck, and constitute a small family termed *hirudenées*, or *sanguisugaires* (bloodsuckers). They are all characterised by long flat bodies, and by numerous rings or close articulations, by means of which they move; by a muscular disc, a sort of cupping-glass

tuated at the last ring of their bodies; while the anterior ents another sucker, at the bottom of which is the mouth, armed with three triangularly disposed teeth. By means ıparatus the animal fixes firmly on the body which it wishes ınd. In the centre of the mouth-sucker are three small p teeth, and near the anterior margin (in the medicinal e ten very small black eyes, arranged in the form of a

At the bottom of the mouth-sucker begins the digestive eeches. Those frequently used in medicine, and so greedy ı blood, easily pierce the skin by means of their teeth. A ommunication to the Société Zoologique d'Acclimation, nown the existence in America of leeches possessing this peculiarity, that they leave no mark on the skin to which applied, so that they must act not by biting but by suction. ious fact is put beyond a doubt by the experiments made ıself by Craveri, a learned Italian. M. du Filippi has placed ches in a new genus, which he terms *Hæmentaria,* and of describes three species, two belonging to Mexico, and one iver Amazon. The blood which they suck passes abunıto the œsophagus and the stomach, which is remarkable ze in comparison with that of the body.

eeches of commerce are the green (*Hirudo officinalis*) and (*Hirudo medicinalis*). Each of these species presents arieties, of different degrees of utility, and thus inviting ılous venders to practise their tricks of trade. A good leech nd flat. The outer skin is of a particular velvety appeart moves in water with great activity, and stretches itself ırkably. Its elasticity is such that it can treble its length, ıe round the finger like a ribbon. The fineness of the compared with the posterior part of its body is also a sign quality. Fraudulent dealers mix the different kinds, or em with blood in the proportion of 45 or 50 to the 100, in make them weigh more, leeches being sold by weight; so ıll leeches, worth 75 francs, are sold for 130. This fraud hus detected: The leech, designedly gorged, has a body less d than that of a leech naturally large and empty; it is to present itself under the form of an olive; placed in is dull and sleepy-like; the velvety appearance of the skin same as that of a leech not gorged. When pressed between rs, one perceives a reddish reflection, except in the Turkey hich does not elongate under the fingers, but the blood ates towards the tail, and then is expelled, sometimes in ı of a jet.

Iode and the Time of Reproduction.—Leeches reproduce es by cocoons, experience shows, though some philosophers ı that the leech is propagated by eggs. M. Borne, in parwho has for eight years patiently and intelligently observed

the phenomena of leech-life, declares that he never saw a si leech produce an egg. The depositing period of the leech can be exactly fixed. It commences about the beginning of sum and lasts a great part of the autumn.

Leeches are hermaphrodites. Each of them possesses a m and a female organ, and during copulation discharges the funct both of the male and the female. Copulation begins with the fi weather, and may generally be observed during a part of the mo of May. Gestation commonly lasts till July; and the exclu occurs during August and September. The advanced period gestation is manifested by an ovoidal yellow swelling in the ant rior third of the body, round the sexual parts. This swelling by zoologists termed the *cincture* (*clitellum*). At the moment of couchement the cincture is very large and very pale; its epiderm raised as if about to be detached. The creature twists, opens mouth, and appears to suffer; speedily there is a compressio each end of the cincture. The leech immediately draws back th anterior part of its body from the ovoid pellicule, which covers th clitellum, as if it were getting out of a hole, and this isolated pel cule becomes the membrane of the cocoon. The leech withdra backwards; but before withdrawing deposits in the interior of th bag several little ovules, in the midst of a quantity of albumin matter. The two openings of the bag soon close, and in their roo there remain two round brownish swellings, which afterwards fal like *opercula*, at the time of exclusion. The cocoon is not y complete. When complete, the cocoon is about the length and thickness of the first joint of a lady's little finger: it wants th spongy tissue which is deposited upon the membrane, like froth light slime, of a white colour. The slightest touch removes it The presence of water is thus always more or less injurious; and the cocoons are almost always deposited either on or in the moist borders of marshes, a little above the surface of the water, and o the plants which deck the moist earth. Having thus, thanks t M. Jourdier, assisted at the accouchement of a leech, we hope o readers are duly grateful: they should be, at least; for the phe nomena which he so graphically describes are not easily to b witnessed, seeing that by the middle of June almost all leech old enough to propagate disappear, and hide themselves in the tu of the marshes, artificial or natural, till the time for depositing.

Each cocoon generally contains from fourteen to fifteen threads or young leeches—at the most, twenty-four to twenty-six; at th least, ten. It is universally observed that the cocoon never co tains an odd number.

Such is the nature of these creatures, the rearing of which i great natural marshes, or in marshes artificially made, forms a important branch of rural economy in France. It may be wort

while of some of our Scottish proprietors to attend to it, seeing t it is not merely profitable to those devoted to it, but is also ad to have an important bearing upon agriculture. In those imunes of the department of La Gironde where hirudiculture been followed for several years, there has been observed a very ble improvement in the condition of all the inhabitants. Wages, h of men and women, are almost doubled; and they are con- itly employed, the one in taking care of the basins and the horses, the others in catching, cleaning, and maintaining the leeches. rearing of leeches, according to the mode practised in La onde, by necessitating, for the purpose of feeding them, the em- yment of a great many horses unfit for anything else, gives rise kind of fattening so considerable as to deserve to be regarded one of the most important and useful novelties which have arisen favour of agriculture. A leech can live in water without food; it grows lean, and loses its strength and activity. Besides, an ed leech does not reproduce itself, or does so imperfectly. It is mportance to feed these annelides. Their digestion is very slow, l they do not require to be fed more than twice or thrice a-year. Borne does not go beyond that, and he takes three years, at most, to *make* a leech. The people round Bordeaux profess to ce a leech in eighteen months, and even in a year—an assertion easily admitted by one who has paid some attention to leeches; yet the fact is demonstrated in the marshes of M. Franceschi, of the breeders in La Gironde. Different modes are resorted n order to produce rapid growth; but the best mode of feeding, that which alone is to be employed if we wish to carry on rations on a great scale, is to gorge the leeches by living nals. Warm blood drawn from the veins of an animal, through skin, is admitted to be that which best suits the leech, and is wed by the most remunerative result. Throughout La Gironde, es, asses, mules, and cows are made to enter the marshes as l for leeches. The disturbance caused by their entrance attracts leeches, which come forth from their retreats, and fasten and ge themselves on their living prey. Bridges lead to the different sions of the ponds into which the animals are driven, and are ediately covered with vast numbers of leeches, which never e their prey until completely gorged. The victims are then n back to a poor pasture, where they painfully endeavour to ain the blood which they have lost. They are thus tortured or six times a-month. It is shocking to see them at these ods, which are usually from the beginning of April to the a June, and then from the beginning of October to the 15th ember.

Horses are much preferred to all the other animals we have ntioned. Cows feed leeches well, provided they can be got into the

water above the knee; otherwise, with their rough tongues they easily shake off the leeches. Asses would be esteemed on account of their docility, but their narrow feet sink too deeply in the bottom of the marshes. But the unhappy donkeys are not permitted thus to escape. M. Franceschi, of Bordeaux, is the inventor of what may be styled drawers for donkeys; their legs being enveloped in these, the drawers are filled with leeches, in proportion to their size, and in the hope that the health of the animals may not suffer. We are glad that this hope is not fulfilled, and that in 1854 the ingenious barbarity of M. Franceschi resulted in the death of all the donkeys so maltreated. M. Jourdier's sensibility is pained by this brutal mode of feeding; and yet, while sympathising with the suffering animals, he gives the advice that they shall always be in good health—*for the sake of the leeches!* Just as the friend of a cannibal might, from anxiety about his health counsel him only to feed on healthy men!

There is need, however, for M. Jourdier's advice, for in the best market for leeches at Bastide all kind of rascality is rife, in order to get rid of disabled or diseased animals. The horse-dealers of Bordeaux are at least a match for those of Paris; and their efforts to hide defects are always culpable, sometimes comical, but generally distressing. M. Jourdier's excellent friend, L'Héritier of the *Pays*, was so saddened by what he saw that he had no wish to visit the marshes.

A less disgusting mode of feeding leeches is that followed by M. Borne and Dr Sauvé, which has the additional recommendation of being economical. In the first days of spring, when the leeches are moving briskly in the marshes, and when they rush in multitudes to the place where the water is disturbed, we may conclude that they are in want of food; for leeches rush out when noise is made, only in hope of living prey on which they may fasten. Their capture is effected thus: In the large marshes of La Gironde men and women, protected by large boots well greased go into the marshes to fish for leeches. In the left hand they hold a bag of very thick linen, and stirring the water with their feet they seize with the right hand the leeches which rush out in hope of prey. The usual way of transporting them is in sacks of thin linen, placed side by side in a long square basket, surrounded with straw in winter, and with moist reeds in summer. This mode proves fatal to vast numbers. M. Borne uses a box, varying in size according to the number of leeches to be transported. For six thousand he uses a box of a little more than three feet in length, and divided into six compartments. At the bottom of each of these he places turf or reeds, and over these moss. On this moss he places a bag containing a thousand leeches, which is likewise covered with moss. And so with each bag in succession

order to avoid the slightest shock. They can thus be carried ng distances with a trifling mortality. A still more useful in- ention is the domestic marsh of M. Meeus. This is a box filled ith river water, turfy earth, and aquatic plants, in which the eches live as in a natural marsh, deposit their cocoons, and change eir outer skin. Two of these boxes—one for leeches not used, the her for leeches which have sucked—are found to be most useful public hospitals. Those desiring to preserve leeches will do ell to remember that the water employed must be river or rain ater, but never water from a well, nor spring water, as it issues om the earth; that vessels of earthenware are preferable to essels of glass or glazed earth; and that darkness is fatal to eches.

But to return to the mode of feeding followed by M. Borne; ere it is: Placing the leeches in little bags, he plunges them in a ath of warm blood flowing from the veins of an animal. The bags re of flannel or of fine linen, for large and moderately large eeches. The very small leeches are put in bags of muslin or fine annel, and carried to the shambles. When the ox, calf, or sheep bled, the blood is beaten in order to destroy the fibrine, and inder the formation of clot, and then the bags are plunged in it. he tissue in which the little creatures are shut up serves as a point f attachment for sucking, and affords the means of occasionally oking at them, to see if they are gorged. The larger leeches re left in this bath of warm blood for five or six minutes, those of iddle size for about ten minutes, the small ones for a quarter of n hour, and the very small ones for half an hour. They are then aken out, washed in warm water, and then placed in cold water be taken back to the marsh.

M. Sauvé also uses bags to gorge his leeches, but in some re- pects his plan differs from that of M. Borne. He carries the lood in cans with double bottoms, which are filled with boiling ater to prevent cooling; and then, like M. Borne, he plunges nto the vessels full of blood the leeches in bags of linen, or prefer- bly of woollen. This warm blood, which retains its fibrine, is, M. auvé maintains, much superior to that which has lost its heat and s fibrine.

It is a kind of satisfaction to know that these bloodthirsty reatures are preyed upon by many enemies, and make dainty morsels to sand-mice, water-rats, moles, the larvæ of the dragon- y, eels, herons, and, above all, wild-ducks. Well may leech- reeders quake when told that in twenty-four hours 200,000 eeches have disappeared in the greedy maws of a flock of wild- ucks.

The details we have been giving are certainly curious, and their lisgusting nature will not repel those who reflect what profit may

be made from those marshes which are so numerous in this country, and hitherto of almost no value. M. Béchade, a little farmer in the neighbourhood of Bordeaux, has become a millionaire by transforming poor marshes, for which he could hardly pay a rent of 300 francs, into magnificent enclosures for leeches, now let for 25,000 francs. M. Jourdier refers to a Parisian capitalist who has embarked in this species of industry with the satisfactory result of a revenue of 15 for 1; that is to say, a leech which then (April 1855) cost 25 centimes, produced on an average 15 leeches a-year, which could be sold at the same price—or, say, 3 francs. Deducting at the most 5 centimes of expenses, there remains a gain of 2 francs 25 centimes, which is enormous when the operation is on a large scale. It is, therefore, credible that a marsh of 48 hectares should let for 250,000 francs, and that enormous fortunes should have been made by this new species of rural economy, which is alike useful to the public and beneficial to the private interest of those by whom it is prosecuted. We shall, therefore, not be surprised at its introduction into this country. We earnestly hope that recourse will be had to a less revolting mode of feeding leeches than we have had the pain of describing: this may possibly be effected by furnishing them with abundant supplies of their ordinary food, which appears to be tadpoles, aquatic worms, and larvæ.

A correspondent asks, "Would leeches thrive in this climate?" In this country only two kinds are reckoned fit for medical purposes—viz. the "brown leech," and the "green leech"—the former found sparingly in Great Britain, but abundantly in northern and central Europe. That it will thrive in this country we doubt not. Leeches abound in India, and we should not despair of receiving them from so distant a region. France imports leeches from Hungary, Turkey, and Syria, besides exporting them to Brazil, Chili, and Peru.

We conclude by informing our readers that the susceptibility of the leech to changes in the atmosphere makes it a true weather prophet; and Mr Merryweather, taking advantage of this peculiarity, has constructed an instrument in which the movements of a leech set a bell a-ringing, and so announce a coming storm.

OTES ON RECENT NOVELTIES IN AGRICULTURAL MECHANISM, AND IN BUILDING CONSTRUCTION.

By Robert Scott Burn.

No. I.

Under the above title we propose, at stated intervals, to give brief descriptions of such novelties in the mechanism of agriculture, or in the constructive details of the buildings of the farm, as seem likely to possess some practical interest to our readers. We use the term "recent" in its widest sense; for we shall likely, from time to time, notice improvements which may have no direct claim to be characterised as recent in introduction, but which, from experience pointing out new features of adaptability to agricultural purposes, or displaying marked features of excellence of working, may yet be said to be recent so far as our readers are concerned, and which may therefore be put before them as novelties.

For obvious reasons, we shall follow no system of classification of subjects to be noticed, but shall give them just as they may present themselves to our attention.

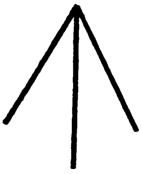
From the circumstance of the great metropolitan show of the Smithfield Club having been so recently held, and from it having been for some years our wont to give in the pages of this Journal a few notes on the novelties there yearly exhibited, we may appropriately commence our present series with a brief notice of the new things which were presented to the notice of the visitor to the mplement galleries of the Show of 1858.

Woofe's Paring Plough.—This implement, which is gradually working its way in the estimation of practical men, was exhibited at the stand of Mr W. Snowden, of Gloucester. The chief features of novelty in the implement are the employment of revolving cutting-knives, which divide the long strip of turf raised by the share into portions of equal and determinate length; and of a clearer, by which the soil which adheres to the share is removed, and the surface of the share kept always clear. The cutting-knives are arranged as follows: A standard passes through the fore-part of the beam, and is terminated by a bow. The ends of the bow afford bearings for a horizontal shaft or axis, which is carried at one side some distance beyond the bearing. This extremity of the shaft carries a circular disc or wheel with a cutting edge, which, as it revolves, cuts the turf in a longitudinal direction, or in the direction in which the plough is progressing. To the central part of the shaft, within the bow previously mentioned, a knife or blade with a curved edge is fixed. As the circular cutter outside the bow

revolves with the onward progress of the plough, the knife inside the bow revolves also, and on each revolution comes in contact with the turf, and cuts it transversely into strips. The cut is not made completely through, but only partial. This enables the mould-board to throw over the turf in a continuous slice, which can afterwards be easily divided by hand. The circular cutter thus makes a continuous longitudinal cut, while the cross knife makes a series of transverse cuts at distances corresponding to the circumference of the circle of its rotation—in practice, 24 inches. To the beam of the implement a curved support is provided, which carries the mould-board and the paring-share; a slot is made in the face of the mould-board, a little above the line of upper surface of paring-share; a bolt or clearer works in and out of this slot; the bolt receives motion from a crank fixed on the axle of the hind wheel of the implement. The other parts of the plough resemble in arrangement and construction the well-known parts of ordinary wheel-ploughs.

Sigma's Multum-in-Parvo Implement. — This was exhibited, along with the other inventions of "Sigma"—the *nom de plume* of a well-known agriculturist—at the stand of his agent, Mr Charles Powell of Ticehurst, Sussex. The *Multum-in-Parvo* is, as its name denotes, one of that class of implements which, by slight alterations and additions, is made capable of serving a variety of purposes in practice. According to the statement of the inventor, never "have forms so various and complete been brought in contact in one light frame, while by a *single horse* the work is done, and well effected too." Although in principle of arrangement opposed to what we consider a good one—namely, that each implement should be arranged to do its class of work without being clogged or hampered by material which, although necessary for the adaptation to another class of work, can only result in a loss, and act as a hindrance to the work which at the time it is performing—still we are in justice bound to say that "Sigma" has, with much judgment and ingenuity, contrived an implement which acts, with comparatively little extra material, as the basis of a series of implements, each performing work diverse in character and of great importance in the everyday work of well-conducted field-culture. The implement can be made to assume five different forms—1. The drill-grubber or scarifier; 2. The subsoil or scuffling plough; 3. The deep-stirrer and horse-hoe; 4. The double mould-board or ridge plough; 5. The expanding broad-share or paring plough. The main implement, or basis of all the varieties, may be described as consisting of a central beam, with neck forward and somewhat arched. The stem of the self-clearing wheel, 10 inches diameter, passes through the front part of the beam, and its height, and the consequent depth to which the implement is allowed to work, is regulated by a pinching-screw. Stilts or handles are attached to

the beam, which also carries two expanding wing-bars. These are attached at their outer extremities to the forward part of the beam by bolts and iron hinges. The other extremities are kept expanded at some distance from the beam by quadrant bars, the ends of which pass through a mortice in the central beam, and are adjusted at any point required by means of set-screws. The angle formed by the wing-bars with the beam may be varied at pleasure.



By attaching to each of the wing-bars two tines with expanding duck-feet extremities, 4½ inches wide, and a fifth to the central beam, somewhere near the point where the stilts join the beam, the implement No. 1, "drill grubber or scuffler," with five tines, is formed, which effectually stirs the soil to a width of 2 feet. The duck-feet point slightly outwards.

Taking off the five tines, and adjusting to the front part of the beam a coulter, sharp and of an angular form, and behind this a shank or vertical stem, also attached to the beam by screws; riveting to the lower extremities of these a flat share or shoe, with dipping double feather, implement No. 2, a "subsoil or scuffling plough" is formed. Behind the coulter, hinges are placed to fasten the mould-board to.

Still retaining the sole or shoe, with coulter and stem last described, and adding to the extremities of the expanded wing-bars nearest the stilts two cutters, one to each wing-bar, with curved blades at their extremities, implement No. 3, "the deep-stirrer and horse-hoe," is formed. The coulter-blades are curved inwards towards the central sole or shoe.

By adding to the "subsoil plough," No. 2, two wings of sheet-iron, 3 feet in length, fastened to the sharp angular coulter by pins and hinges, the implement No. 4, "the double mould-board or ridge-plough" is formed. These wings or mould-boards are also fixed to the expanded wing-bars by nuts, screws, and studs.

By attaching to the flat sole or shoe of the "subsoil plough," No. 2, two straight steel blades, one on each side, 3 inches broad and 30 long, implement No. 5, "the expanding broad-share or paring plough," is formed. The inner ends of the blades are connected to the sole or shoe of the subsoil plough near to its feathered share; the outer ends are secured to the sole by transverse bars. The blades are not parallel to the sole, but spread or expand outwards at an angle nearly similar to that of the expanded wing-bars.

Gardener's Chaff Machine.—This new implement, exhibited by the inventor, Joseph Gardener of Banbury, has been described as an illustration of the method of "taking two bites of a cherry." The whole breadth of the feed of straw is not operated upon at once by the cutting knife or knives; but the feed is divided into two equal

portions, one of which comes forward before the other. This part is cut off by one knife, while the part behind is cut off by a second knife. The whole breadth of straw is thus cut in two portions instead of one. The knives are three in number, and are not set in the same line, but one is in advance of the other, and at different distances from the centre—one cut being nearer the centre than the other. The knives are much shorter than those used in machines where the whole feed is cut at one operation.

Martin's Turnip-cutting Machine.—The principal novelty in this machine is the revolving cylinder into which the roots to be cut are placed, the knives being stationary, and placed inside the cylinder. The metal cylinder which receives the roots to be cut is closed at one end and open at the other; it is keyed on to a shaft, which receives motion of rotation through the medium of a winch-handle. A number of knives are secured to the surface of the cylinder, and are so disposed that their cutting edges project inside the cylinder. If the roots were carried round with the cylinder as it revolves, no cutting action would ensue. To bring the roots within the action of the knives, a plate or breach is provided, which is stationary. This arrests the roots as they are carried round by the cylinder, and keeps them up to the action of the knives. This keeping of the roots to the knives is also farther secured by points or spikes attached to the breast or plate. To reduce the surface of root in the cylinder, a shield is provided, which prevents the roots coming in contact with the knives except at the front of the plate or breast.

Child's American Corn-dressing Machine.—This, from the novelty of its principle of action, and the high reputation which it enjoys in the United States as an efficient corn-dresser, attracted great attention at the Show.

The principle of action is threefold—the blast, the riddles, and the exhaust. It is in the application of the latter that the chief novelty of the machine exists. The blast is made to act twice upon the corn, through the operation of a single fanner or blower, and a single current of air. The first winnowing is effected by passing the corn through the current of air discharged by the fan; and the second winnowing by passing it through the current of air entering the fan. The corn to be cleaned is put into a hopper in the upper part of the framing. From this it passes, in a thin broad stream, on to a riddle carried by a shoe, which riddle has a vibrating motion from side to side. The blast of air from the fan blows off all straws, light matter, &c., projecting them through a shoot in front of the machine. A movable plate, winged at its upper end to the top cover of the machine, is used to give any desired direction to the blast from the fan, so as to cause it to strike either directly or obliquely upon the falling stream of corn. From the first riddle the grain falls upon the second riddle, the

direction of motion of which is in the direction of its length, or contrary to that of the first riddle. The meshes of the screen are such that all sound grain is intercepted, while shrivelled grain, seeds, &c., pass through, and are delivered by a shoot to a box or trough, from which they can be removed as desired.

The grain which passes from the second riddle or screen passes down an inclined plane into a chamber behind the fan which gives the blast. The fan draws its supply from this chamber through an upright pipe. The grain is led to this pipe, where it meets the exhaust or upward current of such a strength that it carries up with it any chaff or light grain, seeds, &c. that may have escaped the first blast, depositing them in a chamber. While the lighter particles are thus carried up by the exhaust current which goes to supply the fanner, the sound grain descends the pipe against the current, and is deposited in a box or suitable trough. It is evident that in proportion to the strength of the upward or exhaust current in the pipe will be the manner in which the substances passing through it are acted upon: for the current may be so strong that the sound grain may be lifted up and carried off along with the seeds, &c.; while, on the other hand, it may be so regulated that the sound grain may be balanced or weighed, as it were, that it shall be kept suspended in the pipe, the seeds, &c. passing away. It is in the facility with which the strength of current may be regulated in proportion to the specific gravity of the sound grain, that the utility of the principle of "exhaust" is so marked. The method by which the degree of strength of the exhaust is regulated may now be explained.

In addition to the pipe previously mentioned, through which the fanners draw their supply of air, producing the exhaust, they also draw through a valve placed in the top of the chamber behind the fanners. This valve is of considerable area, and opens inwards; it is held in its seat by a weight adjustable at the end of a lever, the force by which the valve is kept closed being varied by increasing or decreasing the distance of the weight from the centre of vibration of the lever. When the weight is so adjusted that it is about half open when the fan is running at its "mean speed," any variation in the speed of the fan does not affect the strength of the exhaust current in the pipe. As the speed of the fan slackens and demands a less supply of air, the weight on the lever of the valve preponderates, and closing the valve lessens the entrance of the air through the valve; the fanner then draws more from the pipe through which the grain is passing, and increases the strength of the exhaust. On the other hand, if the speed of the fanner is increased, demanding more air, the downward pressure on the upper surface of the valve is increased; it is thus opened further; a greater quantity of air is admitted; the fanner consequently draws less from the grain-pipe, and the strength of the exhaust

current in it is reduced. The *regularity* of the current is thus secured; while by adjusting the weight on the lever of the valve, any degree of *strength* of current may be obtained to suit the different qualities of grain. We now turn from a consideration of the novelties exhibited at the Smithfield Club Show, to other matters, of which the first that claims our attention is

Rickett's Steam Cultivator.—In an article on the Chester Show in last Number, we have described this apparatus as there exhibited and tried.

While engaged in preparing this for press, we have received from Mr Ricketts a description of the improvements which the experience of the Chester trial showed him to be necessary. The first of these is the means by which the cultivator is made self-regulating, so far as the depth to which the tines work is concerned. This is effected by adding a large wheel, running outside of the engine in the uncultivated ground. This is adjustable by screws, and the whole cultivating apparatus raised or lowered as desired by means of a steam-pump placed on the foot-plate of the engine. Mr Ricketts' attention has been mainly given, however, to devising some simple means of rendering the pressure of the apparatus on the land less severe, bringing it down to "almost that of a man's foot." The plan proposed and patented by Mr Ricketts for this purpose is as follows:—Instead of one large driving-wheel, two, three, or more small wheels are employed. Introduced beneath and around these is an elastic roadway formed of a thin broad steel hoop, so proportioned that when the load comes upon it at two or more points—say each 18 inches from centre to centre—the hoop yields to the weight until it becomes nearly flat, forming a bearing-surface of about 6 square feet. Mr Ricketts is using at present 7-feet hoops, 15 inches broad, 3-8ths of an inch thick, with 15-inch internal wheels. This arrangement of elastic roadway enables Mr Ricketts to introduce a good adjustment of the cultivating part of the apparatus, as he can place the crank-shaft below the boiler vertically in the centre of the hoops, the cylinder beneath the foot-plate, and drive the cultivator shaft direct from the crank-shaft by means of outside cranks and connecting-rods. This throws the centre of gravity of the apparatus very low, and enables the whole of the mechanism to be fixed to the framing independently of the boiler.

Keddy's Steam Cultivating Machine.—This apparatus (patented August 18, 1857) is of the portable class, and is intended to move itself over the land which it cultivates. The machinery consists of three parts—*first,* the anterior part, for guiding the apparatus over the land; *second*, the arrangements by which the lower portion of the apparatus bears its whole length upon the land, and by which the machine is made locomotive; and, *third*, the cultivating apparatus

The guiding mechanism consists of a drum or roller *a*, carried by and turning upon a vertical shaft *b*. This shaft also carries a horizontal toothed wheel *c*; this engages with a pinion *d*, fixed in the lower end of a vertical shaft *e*, the upper end of which carries a bevil-pinion *f*; this engages with a second bevil-pinion *g*, fixed in the end of a horizontal shaft, which is carried backward, and terminates at the extreme end of the apparatus with a cross handle *h*. By moving the handle *h*, the bevil-pinion *g* engages with the pinion *f* in the shaft *e*, and, turning it round, actuates the pinion *d* and toothed wheel *c*. This latter being fixed on the shaft *b*, it is turned round along with the roller *a*, which thus guides the apparatus as required. To adjust the height of the apparatus as the depth to which the cultivator's work is increased, the shaft *b* is provided with a piston working in a cylinder. By introducing steam into this so as to act on the under or upper side of the piston, the shaft *b* and roller *a* are raised or depressed as desired.

The second part of the apparatus consists of the mechanism by which the weight is distributed over the land, and by which it is made to progress as the cultivators are brought up to new work. The carriage supporting the steam-engine and boiler moves upon two large rollers, *a* and *b*; these rollers are geared together by connecting-rods. A jointed endless band or platform *c* works over the rollers, composed of a series of plates jointed together in a peculiar manner, so as to give great flexibility. The joints of the platform or endless band *c* work in semi-cylindrical grooves in the peripheries of the rollers *a b*. A frame *d* within the platform *c* carries a series of small rollers, which, engaging with the grooves in the rollers *a b*, cause the lower portion of the platform *c* to bear on its whole length on the land over which the apparatus is passing.

The cultivating part of the apparatus consists of two parts. The first is composed of a series of screws, blades, or rotatory tillers, resembling augurs or brace-bits in form—working in the lower part of vertical shafts, six in number, placed in front of the machine. These, as they rotate, screw into and reduce the earth to a tilth. One-half of the screws rotate in a direction contrary to that of the other half. Coulters precede the screws or tillers. Rotatory motion is imparted to the shafts of the tiller through the medium of bevil-gearing actuated by the engine. The frame in which the tiller-shafts are carried is capable of being raised or lowered, by means of vertical screws and bevil-gearing, so as to bring them deeper into or out of contact with the soil.

The second portion of the cultivating apparatus consists of a frame carrying a series of straight prongs or tines fixed to a plate, to which, by means of a cam, an oscillating motion is given. The straight prongs are followed by curved ones, which serve to collect the grass or twitch from the land operated upon by the

connecting-rods. A rack-and-pinion movement is connec the central frame, and by means of which each half of the beam, with its set of three ploughs, can be lowered or r desired. By this arrangement a comparatively light a beam is obtained, 12½ feet in length and some 12 cwt. in Two wheels are provided, which run on the unploughed g central wheel running along the bottom of the furrow la The guiding-wheels are provided with projecting ribs peripheries, and are turned on swivels by the ploughm sits on one end of the beam—through the agency of a leve furrow-slices all lie one way, the width being 9 inc depth being regulated as required. The price of the plo three furrows, is said to be 50 guineas. In an account of a this plough given in the *Mark Lane Express*, it is stated quantity of land ploughed in an hour by it was 1 rood 2 or at the rate of 4 acres in 10 hours. The rate at which th engine of 8-horse power drew the plough was 3 miles p turning over 3 furrows, each 9 by 6 inches, the cost per ac set down at 9s. For a longer field, necessitating less frequ ings, the quantity ploughed per day of 10 hours might be 5 acres, thus reducing the cost per acre to 7s. 6d.

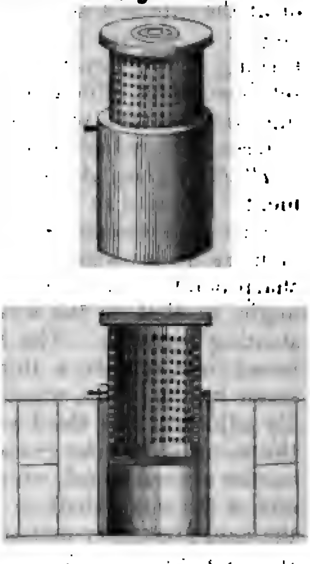
Platt's Tilling Apparatus.—The principle of this novel ment—patented in this country by Mr H. M. Platt of Ne —consists in the application of a revolving screw, formed or more blades wound round a central shaft, and terminat sharp point. The shaft of the screw is placed at a con angle, so that as the screw revolves, it enters the grou slanting direction. The frame carrying the screw runs broad-tired wheels, a third wheel being carried in front

ı thrown off the blades, and is broken or cut up as the edges
e blades come in contact with it. The action of this appa-
in subsoil ploughing is said to be peculiarly advantageous,
ıuch as the subsoil, in place of being turned up so as to lie
ıe upper surface of the earth, is completely subdivided, and
buted evenly throughout the mass. Where steam is employed
ıg the frame, a number of screws are placed parallel to each
.

ıdell and Balk's Steam-Boiler.—This, which took the prize
stationary boilers" at the Chester Show in July last, is likely
set a want long desiderated in tubular boilers—namely, a
' means of examining the condition of the tubes, and of
ughly cleaning them, and this without impairing the integrity
e work. The examination and cleaning-out of Cornish or
ıal-flued boilers is always a source of considerable annoy-
loss of time, and expense; but in the case of multitubular
rs, it is almost an impossibility to examine and thoroughly
out their interior. In the boiler now under notice, the fire
with the tubes, are formed as one piece, as also the back
; but in place of being riveted to the shell of the boiler at
ront and back ends, they are *bolted*, the faces of the shell and
ack of the tube-plates being accurately made, so that steam-
joints are easily secured. By simply unbolting the end
s, the fire-box and tubes can be
ıdiately withdrawn for examina-
and cleaning; while the shell,
left perfectly clear throughout,
be thoroughly examined exter-
and internally. For this form
ıiler no brickwork is required;
simply supported by two cast-
chairs or saddles, and is imme-
ly ready for work. It is manu-
red by the well-known firm of
ıome and Sims of Ipswich.

*ıoker's Tubular Ventilator for the
ıission of Fresh Air to Stables,
s, &c.*—This simple apparatus, as
ıwn by the drawing (see fig. 1),
sts of a tubular piece of pottery
her material fixed in the wall of
building to which it is desired
mit fresh air. In the interior of
a second tube is made to slide
ıd out, this sliding piece being
rated with holes. It is obvious that, in proportion as the
g piece is drawn out, so will the number of holes exposed be

Fig. 1.



increased, and, in like proportion, the quantity of air admitted through them. The addition of a small stop or peg prevents the inner tube being completely withdrawn. The ventilators are made of all forms—square, circular, or elliptical—and of all materials, from the coarsest pottery to the costliest porcelain. For sitting-rooms they are made highly ornamental.

West and Hubbell's Patent "Oak Hall" Window.—Those who prefer ventilation to be effected by means of the joint operation of the window and the fireplace, will find in this form of window every facility for regulating the direction and amount of air admitted to the apartment to which it is applied. It is an improvement on what is known as the French or casement window, embracing all its advantages, and avoiding all its defects. Fig. 2 represents the window closed, and fig. 3 the window open. From fig. 3 it will be seen that the upper sash can be lowered to any extent desired, so that the foul air of the room can make its

Fig. 2.

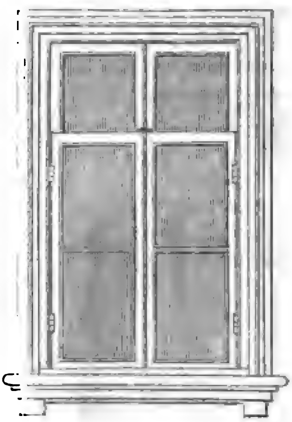
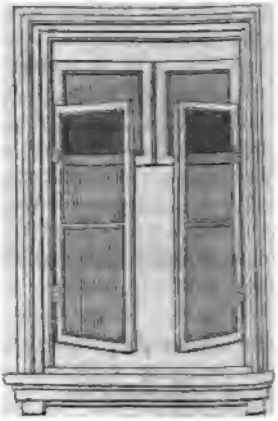


Fig. 3.

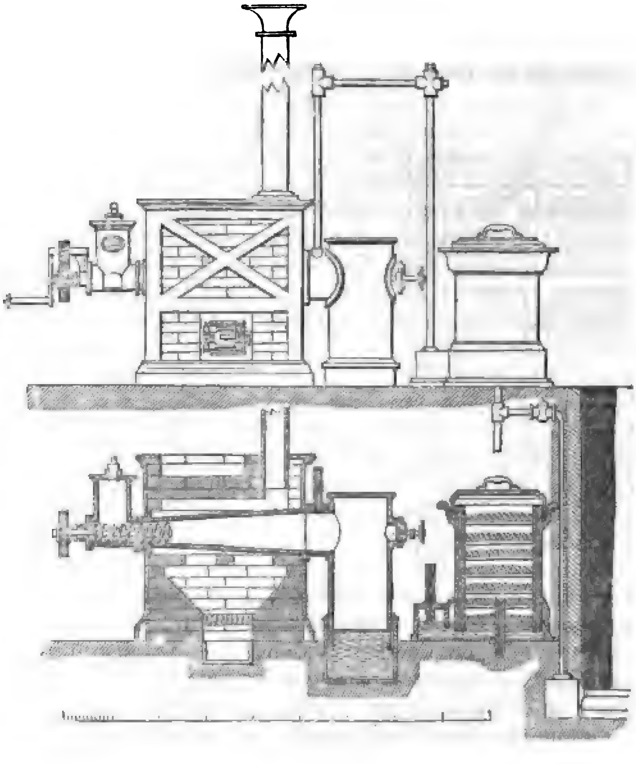


escape; while, on the other hand, the lower sashes can be raised so that fresh air can be admitted from below. Moreover, as the lower sashes can be opened like a door, by opening them at equal angles the current of air can be directed to the centre of the room; or by opening one while the other is closed, the current can be directed to any side desired. Thus by opening the right hand sash half way, the current will be directed to the left hand of the room, and *vice versâ*. From the upper sash being capable of being raised or lowered, it is easily placed within reach of cleaning or repairs. The lower sashes are completely s and weather tight when closed, the centre mullions being tongued and grooved like flooring-boards; the stop-bead at the bottom acts also as a medium to exclude the weather, the drip being

the outside. These arrangements also make the sashes quite fixed in the frames, so that all rattling or shaking is prevented. The sash also allows of the use of inside blinds, either when open or shut; and, further, no French bolts or fastenings are required.

Gas Apparatus for Farm Use.—A cheap, easily-managed, and economically worked gas-making apparatus for farms and rural localities has long been a desideratum. A form of apparatus, manufactured by Mr T. B. Porter of Lincoln, which we have lately inspected, and of which report speaks very favourably, is, we think, likely in many respects to meet this. We give in fig. 4 a drawing of this compact apparatus, the principal feature

Fig. 4.



of which is the ease and economy with which the retorts are worked—that process which, in other arrangements, constitutes the most disagreeable part of gas-making, but which, in the apparatus now under notice, is effected with amazingly little trouble and inconvenience.

The retort used, as may be seen from the drawing, is not of uniform diameter throughout its length, like the retorts usually

employed, but gradually widens from the front to the back. The back terminates at the top of a cylindrical vessel, at the foot of which a tank of water is provided; into this the coke is pushed, in the manner hereafter to be described, where, by coming in contact with the cold water, it is instantly cooled, and from which it can be removed at pleasure. The front part of the retort is of uniform diameter for some distance, and contains an Archimedean screw, which is turned by a handle placed on the end of the shaft, continued through the cover of the retort. Connected with the upper part of this end of the retort is a vertical chamber, the aperture of which is closed by a tightly-fitting stopper, which can be removed at pleasure. This chamber or hopper contains the charge of coal from which the gas is to be produced. On the hopper being filled with coal, the stopper is put tightly in; and on turning the handle or wheel of the Archimedean screw, the charge is gradually transferred from the hopper to the interior of the retort. The charge thus delivered to the retort is allowed to remain exposed to the action of the fire for about one hour. The hopper is then filled a second time, and by means of the Archimedean screw the charge is transferred from it to the retort—the second charge pushing the first charge forward into the gradually widening space of the retort. Another hour is suffered to expire, when a third charge is supplied to the hopper, and transferred to the retort, pushing before it the two former charges. The fourth charge, which is in like manner made, pushes the first charge out of the wide end of the retort into the vertical chamber and water-tank. The coke thus formed is found to be a harder, denser, and consequently more valuable kind than that resulting from the ordinary system—this arising, doubtless, from the compression to which it is subjected in being forced into the retort by the screw. In consequence of there being no escape of gas during the process of charging the retort—a loss inevitable in the old system—the quantity of gas obtained by this apparatus is greater than that produced by the usual arrangements; whilst another source of increased "make" arises from the circumstance that the vapours evolved from the last charge introduced must all pass along the highly-heated charge or charges which precede it, and along three-fourths of the heated retort. Much of the tar produced in the old system is by this apparatus converted into gas. The purifying apparatus is of extreme simplicity, the "hydraulic main," the "condenser," and "purifier," all being contained in one vessel of very limited dimensions. The upper part of the drawing shows the connection of the various parts—part only of the retaining wall of the gasometer being shown. The cost of the gas produced by this apparatus is stated to be 4s. 6d. per 1000 cubic feet where a thirty-light apparatus is used: where a sixty-light apparatus is employed the cost will be reduced to 3s. per 1000 cubic feet, and as much coke will be produced as will keep the fire of the retort-furnace going.

THE FARMERS' NOTE-BOOK.—NO. LXIII.

On the Feeding of Cows for the production of Butter.—Sir John Sinclair has stated that "it is supposed that the same quantity of herbage that would add 224 lb. to the weight of an ox, would produce 900 English gallons of milk." Now if we reckon 6 oz. of butter to be the average weight obtained from a gallon of milk, we will get 337 lb. of butter from the same quantity of herbage as was supposed to produce 224 lb. of beef. Or, if we convert the two into their respective money values, according to present rates, we will obtain £6, 10s. 8d. as the value of the beef, reckoning the beef at 7d. per lb., and £16, 17s. as the value of the butter, reckoning the butter at 1s. per lb. If the hypothesis of Sir J. Sinclair be correct, there can be no doubt that it is the interest of the farmer to adopt the dairy system in preference to the feeding of cattle. But, even granting that the difference between the production of beef and butter is not so great as stated by him, yet it is generally admitted that there is a considerable margin in favour of butter, particularly when we take into account the relative price of the two at the present time.

The importance of the subject being admitted, we may inquire shortly as to what kind of feeding is best adapted for producing the largest yield of butter. Aiton, in his *Agriculture of Ayrshire*, published about the beginning of this century, tells us that the winter food of the dairy stock at that time was the straw of oats, or, towards the muirish parts of the county, the hay of bog meadows, frequently but ill preserved. "For a few weeks after they calved, they were allowed some weak corn and chaff, boiled, with infusions of hay; and by way of luxury, a morsel of rye-grass, or lea-hay once every day; and of late years, by some farmers, a small quantity of turnips in the early part of the winter, and a few potatoes in the spring have been added." The effect of such feeding on the animals is apparent when they are turned out on the grass in summer; "many of them are so dried up and emaciated, that they appear like the ghosts of cows, their milk vessels are dried up, and it is not till they have been several weeks on the grass, that they give either much milk or that of a rich quality." The summer feeding was generally pasture; and though a much better system of feeding has been practised throughout the country since the introduction of turnip husbandry, yet an approximation to that described by Mr Aiton will be found in some of the upland districts.

Farmers have now, however a great variety of food from which they can make a selection; and the problem to be solved now is not—how a sufficiency of one particular kind of food is to be gathered together to keep the cows in life for a considerable period of the year, but rather what variety of food, or better, what mixture of

varieties, how much, and in what state (raw or cooked), will prove most profitable for the production of butter. The main-stay of the dairy farmer now, as formerly in summer, is grass; in winter, however, there has been a great improvement in the feeding of the cows from the use of turnips and other roots, as well as many other substances, such as beans, draff, or distiller's and brewer's grains, linseed and rape cake, &c. Even now in summer, in some districts, it is found advisable and profitable, where butter is wanted more than milk, to give to the cows some nourishing food, in addition to the pasture, at the very height of the season. Draff and bean meal are the two substances more generally used in such circumstances.

If the production of butter is to be the main object of keeping a dairy, there are two things to which the farmer should pay particular attention: the kind of cows he keeps, and the feeding. When we speak of the feeding, we mean not merely the quality of what food the farmer purchases, but of what is grown on his farm. It is well known that the grass and turnips on some farms will produce far more butter from the same quantity of milk than those grown on others. We have known cattle fed on turnips alone from particular farms made fat in the same time as similar animals fed on turnips, with the addition of two or three pounds of linseed cake each per day, the treatment and housing of the animals being alike in both cases. Certain fields will give a larger proportion of butter to the milk than others on the same farm. A farmer, therefore, should be guided, not only by the locality, but by the farm, in determining what department of the dairy he should turn his attention to. While he may find it most profitable to sell all his sweet-milk, even at a considerable distance from town, it might be ruinous to him to convert it into butter, unless he used a great deal of extra food for his cows, the profit from which, unless judiciously used, is not always certain. We are aware that often draff is used where the production of butter is the main object, with the certain result of a large increase of milk, and also increase of butter, but by no means in the same ratio. We are convinced that were farmers to make some experiments, and not be satisfied with the small increase of butter as a proof of the value of the draff, they would come to the conclusion that it would be their interest to use less draff and more of other substances. Of course, if all the milk is to be sold sweet, the larger the quantity that can be obtained, however watery or inferior in quality, the greater will be the return. In this case, the consumer, not the farmer, is the loser.

Without referring at all at present to the kind of cow most profitable for a butter-dairy, we pass on to a consideration of the kinds of food that may be used most profitably for the production of butter. The great authority on this subject is Mr Horsfall, who

has laid the public under great obligations to himself for the publication of his experiments and views on this interesting question. His method of feeding is the following:—In May his cows are turned out on rich pasture near the homestead; towards evening they are housed for the night, when they are supplied with a mess of a steamed mixture, to be afterwards described, and a little hay each morning and evening. During June mown grass is given to them instead of hay, and they are also allowed two feeds of steamed mixture. This treatment is continued till October, when they are again wholly housed. After this they receive steamed food *ad libitum* three times per day. After each meal cabbages are given, from October till December; kohl rabi till February; and mangold till grass-time—the supply of each of these varieties of green food being limited to 30 or 35 lbs. per day for each cow. 4 lbs. of meadow hay are also allowed after each meal, or 12 lbs. per day for each cow, and water is placed before them twice a-day, of which they partake as much as they feel inclined for. The steamed food spoken of above consists of "5 lbs. of rape-cake, 2 lbs. of bran, for each cow, mixed with a sufficient quantity of bean straw, oat straw, and shells of oats, in equal proportions, to supply them three times a-day with as much as they will eat. The whole of the materials are moistened and blended together, and, after being well steamed, are given to the animals in a warm state. The attendant is allowed 1 lb to 1½ lbs. of bean meal per cow, according to circumstances, which he is charged to give to each cow in proportion to the yield of milk, those in full milk getting 2 lbs. each per day, others but little: it is dry, and mixed with the steamed food on its being dealt out separately." This is certainly high feeding, but it is amply repaid by the results; for while cows fed in the ordinary way seldom produce milk which yields more than 1 oz. to every quart, Mr Horsfall's milk gives upwards of 1½ oz. for every quart. It is also an important part of his system never to allow his cows to fall off in condition. He considers the maintenance of the condition essential to a large yield of milk. There can be no doubt of the soundness of this opinion. A cow low in condition cannot give the same quantity of milk, as much of the nourishment of the food is drawn off to make up the condition of the animal. And when a very lean cow is put on rich food it is some weeks before the full benefit of the food can be obtained in milk, for the reason stated above. Another useful deduction made by Mr Horsfall from his experiments is, that albuminous matter is the most essential element in the food of the milk cow, and that any deficiency in the supply of this will be attended with loss of condition, and a consequent diminution in the quality of the milk.

In Scotland bran is not very often used as an ingredient in any mixture of food for milk cows; but it will be seen from the fore-

going that it forms an important part of Mr Horsfall's mixture. Some time ago we came upon the following extract, we believe, from the *Irish Farmers' Gazette*, which gives some valuable hints as to the use of different substances in the feeding of milk cows:—"In reading over the experiments on feeding in Stephens, a difference of opinion exists as to the comparative fattening qualities of linseed cake, bean, and other meal; and in the *Report of the Larne National Agricultural School for* 1853, 1 lb. of beans is said to be equal in fattening qualities to 30 lb. of turnip, and nearly 3 lb. of oatmeal. I tried the bean-meal one season, at the rate of 3 lb. a-day boiled for each milch cow, with mangel, turnip, and hay. By February one of them was fat, but I may say dry; and the others with about half the quantity of milk they had when commencing. I tried for two winters oatmeal, the same quantity in the same way, and each cow gave three times the quantity of milk and butter, and turned out full better the following summer. I tried the same quantity of yellow Indian meal last winter, and I think it good for both milk and butter. I tried bran for three winters, at the rate of 4 lb. every night for each cow; it was equal to the oatmeal, while using, and my cows turned out better the following summer than on any other feeding. The bran not only keeps them healthy, and gives them a greater relish for their food, but there is some combination of qualities in it beyond what any writer I have seen attributes to it."

The state in which the food is given has also a great effect in the production of both milk and butter. We have observed more than once that the yield of butter and milk is never so great when we give cows boiled turnips, with beans boiled quite soft amongst them, as when they get the boiled turnips and the same weight of beans made into meal and mixed raw with them. Again, there is more milk and no taste of the turnip in it, when the turnips are pulped and mixed with cut straw or chaff and fermented, than if the same weight of turnips are given whole and raw. In the *Journal d'Agriculture Pratique* we read a short notice on this subject by M. Lejeune, a director of the Agricultural School at Thourout, in Belgium. The facts he reports are not to be regarded as experiments instituted to test any theory, but are merely extracted from his accounts, and show the importance of attending to the mode in which their food is given to milk cows. In February 1855 the milk of eight cows was selected for experiment. The cows were fed in the following manner:—Each cow got per day [illegible].4 lb. of meadow hay, 13.2 lb. of straw, .48 lb. of linseed meal, [illegible] lb. of beetroot, and a cooked mash, consisting of 55 lb. of turnips, 27 lb. of beetroot, 1.2 lb. of linseed meal, 3.2 lb. of rape-cake, 1.1 lb. of grain dust, 1.1 lb. of mixed meal, about 1¼ oz. of [illegible] and 6 gallons of water. From this very watery diet a [illegible] quantity of milk was obtained, 16 quarts of which gave 1 lb.

of butter. In the month of February 1856, the calculation was made from the milk of 10 cows, 8 of which were those with which the observations were made in the previous year. The nutritive value of the food detailed above was calculated to be equivalent to upwards of 30 lb. of good meadow hay per head. The food given in 1856 consisted of oat straw, beetroot, the meal of rye, oats, and buckwheat, linseed cake, rape-cake, and the dust of wheat or bran, given in such proportions as to make the equivalent value of the day's feed equal to a little more than 31 lb. per head of hay. None of it was cooked, and the beetroot was reduced to small pieces and sprinkled over the meal. There was not the same quantity of milk, but the proportion of butter was much larger, being 2 lb. of butter for every 20 quarts of milk. The cows, with the exception of the food, were managed in the same way in both years, and there were more newly-calved cows in 1855 than in 1856.

Feeding of Horses.—It is a golden rule with all manufacturers always to have their machinery in good working order. With no manufacturer ought this rule to be more imperative than with the farmer, and from none is so much knowledge and attention required in its performance as from him. For what is his machinery? It is not confined, as some might suppose, to the steam-engine, threshing machine, &c., but his principal machinery, and that which requires most attention in its management and keeping up, is his horses. What the steam-engine is in ordinary kinds of manufactures, the origin of motion or force through which the results aimed at are obtained, horses are in farming, carrying on by the exertion of muscular power those operations of ploughing, carting, &c. through which the ordinary manufactures of the farm, such as wheat, beef, roots, &c., are produced. And it is as necessary for the farmer to provide against the tear and wear of his living machines as of his inanimate ones. We purpose here to devote a few lines to this important subject, showing by one or two facts that there are different ways of accomplishing the same end, and that some are more economical than others.

Farm horses are generally fed on the ordinary produce of the farm. In winter they receive in the morning a feed of the light oats, in the forenoon a similar feed; about five o'clock, when they return from work, a small feed of turnips, light barley, and chaff, or corn-dust boiled together, and at eight o'clock a larger feed of the same mixture, with as much oat-straw throughout the day as they can consume. Some farmers allow their horses to get as many raw Swedish turnips as they choose besides the above feeds; while others save the oats by giving a liberal allowance of potatoes as a substitute. Within the last two or three years Indian corn has been used very extensively in place of oats, on those farms where oats are not so much grown, and has been found to answer well;

the use of it has also been extended to some hunting stables with good effect. In summer, horses that are on full work generally receive the same quantity of oats as in winter, with cut grass, instead of the feed of boiled roots and grain, and the straw. We are happy to say that every year the practice of turning out horses that are on hard work to the field to gather what food they can there has become more rare. The practice is not only cruel to the horses, but is attended with a great waste of food and manure. There are many other substances than those mentioned above which are used for the feeding of horses, such as bran, beans, oilcake, barley-dust, &c.: it is seldom that farm horses receive hay, excepting during spring.

Mr Mechi's method of feeding is deserving of attention. "In summer his horses are fed in mangers on wheat straw chaff, cut one-eighth of an inch, and tares, lucerne, or green rye, cut also into chaff the same size, adding ground beans, oats, or meal, with linseed. In winter his carrots, swedes, and mangolds will be well washed, passed through Gardener's turnip-cutter, and again passed through a toothed-cutter machine, so as to become what I call root-chaff; it will then be mixed with very fine wheat, beans, or oat-straw chaff, and a little ground beans, barley, or oatmeal, soaked linseed, steamed potatoes, and a little salt, varying the food as much as possible, to stimulate their feeding." Here, again, is the method of feeding practised by Mr John Croall of Edinburgh, one of the largest coach-horse proprietors in Britain. His horses in Middlefield stables, Edinburgh, are fed as follows:—

4 lb. of cut wheat, or oat straw, or chaff,
¼ lb. of crushed oil-cake,
1 lb. of barley,
1 lb. of beans,
2 oz. of linseed,
¼ oz. of salt,

for one feed for a horse. The mixture is made up in this way: The cut straw or chaff is spread out in a large wooden trough to the depth of 6 inches; the other ingredients, being boiled into a liquid, is poured over the chaff; a fresh layer of chaff is spread over it, and then another dose of the mixture given, and so on, layer upon layer, till the trough is filled, when the whole is thoroughly mixed together, and allowed to cool. Besides the above, each horse is allowed a bunch of wheat straw in their racks, and 2 lb. of bruised oats mixed with peas, barley, wheat, or beans, with a sprinkling of salt, and no hay. Carrots are also a favourite article of diet with horses. We have heard of a farmer feeding his horses on 5½ stones of carrots and 2½ stones of hay made into chaff, during the winter months. As the days became longer, some oats were added to the carrots and hay. When the carrots failed, 16 lb. of oats did not keep them in as good condition as the [illegible] stones of carrots.

But perhaps one of the greatest improvements in the feeding of horses is the bruising of oats; they should not be crushed or broken into meal, but only bruised. One of the most conclusive experiments we have on this subject is that which was performed by the London Omnibus Company. So much importance did the Members of the *Société Imperiale et Centrale d'Agriculture* attach to this experiment, that they despatched M. Renault, the director of the veterinary school at Alford, to London, to report on the method adopted by the Company. M. Renault's report is now before us, from which we extract the following particulars. The Company possesses nearly 6000 horses, the one half of which were confined to one kind of feeding—viz. that of bruised oats and cut hay and straw, and the other half to whole oats and hay. The ration allowed per day to each horse, according to the one system, was—

Bruised oats, ...	16 lb.
Cut hay, ...	7½ „
Cut straw, ...	2½ „
	26 lb.

The quantity allowed according to the old system was—

Unbruised oats, ...	19 lb.
Uncut hay, ...	13 „
	32 lb.

There is thus a saving of 6 lb. on the feeding of each horse; and this saving is not merely in the quantity, but in the value of the articles employed; for we have straw in the former case substituted for hay in the latter. The advantage of the one kind of feeding over the other is far more apparent when we reduce both to the money value. The saving by using the bruised oats and cut hay is estimated at about 2½d. per day for each horse, which is equal to £62, 10s. per day for the 6000 horses. And this saving was accomplished without any sacrifice whatever; for all the coachmen, and those having charge of the horses, agreed that the difference, if any, in the condition of the horses, was in favour of those fed on the bruised oats and cut hay and straw. M. Renault gives also the result of an experiment by M. Etherington, one of the most extensive coach-hirers in London. He selected two horses which ran in the same carriage. To the one he gave about 17.8 lb. per day of unbruised oats—to the other about 14.3 lb. of bruised oats. This experiment was continued for a month, when there was little apparent difference in the horses, that little being in favour of the one getting the bruised oats. The experiment was then reversed: the horse getting the bruised oats was allowed the same quantity of whole oats as the other got; and this latter got the same quantity of bruised oats as its neighbour was getting

n the previous month. Any slight difference in the condition of he horses, after a month's trial, was in favour of the bruised oats.

M. Borie, in the *Journal d'Agriculture Pratique*, also mentions two cases in which the system of bruised oats and cut hay has been adopted in France. The waggon-horses, employed for 14 hours per day in the carting traffic of one of the railways in France, used to get 26 lb. of oats (whole), 13 lb. of hay in bunches, 2.2 lb. of bran, and 15 lb. of straw—the hay and straw uncut. Now they get 15 lb. bruised oats, about 9 lb. of cut hay, 9 lb. of bruised barley, and 15 lb. of whole straw. So the omnibus-horses in the employ of the same railway company, which run about six hours per day, used to get about 20 lb. of unbruised oats, 11 lb. of hay in bunches, 2.2 lb. of bran, and 13 lb. of straw. Now they get 11 lb. of bruised oats, 6½ lb. of cut hay, 6½ lb. of bruised barley, and 13 lb. of uncut straw. We could multiply instances on this important subject, but those which we have adduced are, we think, sufficient to show the great advantage of bruising oats and cutting straw or hay for horses, whether they are employed on the farm or for carting purposes, or for riding and post-work in coaches and omnibuses. Many farmers, we have no doubt, have had vague ideas of the profit of feeding on bruised oats; but we trust that the experiments above detailed have brought before their minds the advantage in a more realisable form, and will induce many to try a system which will produce such a saving at a time when all economy is necessary in farming operations.

Phospho-Peruvian Guano and Sombrero Phosphate.—The high price to which Peruvian guano was raised a few years ago by the Peruvian Government, and its agents in this country, has caused an inquiry as to the relative values of other special manures, which has been productive of much good to the agricultural interest. It has been found, for instance, that as large crops of turnips can be raised at a cheaper rate by means of other manures, alone or mixed, than by Peruvian guano—that, whether from the guano not being as good as formerly, or from the land becoming *guano sick*, an equal quantity applied to the same extent of land, of similar quality and condition, will not produce an equal result now as formerly; and that where Peruvian guano has been extensively used, its effects are certainly much diminished. This has been most marked in the application of Phospho-Peruvian guano, a given weight of which is found to produce a better crop of turnips than an equal weight of Peruvian, when the application is made in those districts where the Peruvian had been liberally used for some years previously.

Another good result arising from the high price of guano is, that farmers have been forced, for the sake of economy, to apply it

and other manures in smaller quantities than they were in the habit of doing formerly; and they have discovered that, in many instances, if they exceeded in the application a certain quantity of one kind of manure, or of one particular kind of mixture, the produce was not increased in proportion to the increased quantity of manure, and in some instances there was no increase whatever, but the reverse. We have more than once before drawn attention to this fact, and there is no part of practice in which a farmer is more interested. We trust that, as the season for trying experiments on this subject is again at hand, farmers, for their own satisfaction, will institute a few for themselves, and, we may hope, for the public good, so as to guide future practice. Our own conviction is, that for some years back the great luxuriance produced in their crops by the application of nitrogenous manures, has made farmers attach a comparatively higher importance to them than they really deserved, particularly when an effect of that favourable opinion was the almost total neglect of other useful manures.

We are always glad, when we have it in our power, to introduce to the notice of our readers new varieties of manures which can be brought in competition with Peruvian guano, one of the most formidable rivals of which at present appears to be the Phospho-Peruvian. What is it? is a question that is now often put, as experiment after experiment is published, showing results in its favour. Is it a natural guano or an artificial manure? To enable us to answer this question, we are indebted for the information to Dr Cameron's small work on the *Chemistry of Agriculture.* "The base of this valuable manure," says Dr Cameron, "is what has been termed a *pyro-guanite*, found on the surface of a group of trap-rock islets within the tropics." It occurs as a dense, hard substance, in masses arranged in concentric layers, and consisting principally of a phosphate of lime, containing one equivalent less of base than is found in the phosphate of lime, existing in bones, or in other varieties of guano. Hence the facility with which the importers have been able, with a small quantity of sulphuric acid, to convert the phosphate of lime into a soluble super-salt.

The excellence of Phospho-Peruvian guano, as an artificial manure, will be obvious, if compared with inferior phosphatic guanos and other manures made from bones, coprolites, apatite, &c. For every 10 per cent of soluble phosphates in these, there are found, at least, 30 per cent of hydrated sulphate of lime; whilst a considerable quantity of water and other materials of little or no value as fertilisers, are necessarily added in the process of manufacture. To obtain from any of these materials an amount of soluble phosphate of lime equal to that yielded by the Phospho-Peruvian guano, nearly 20 per cent, there would be produced about 70 per cent of hydrated sulphate of lime, in contrast with only 25 per cent in the other case.

Phospho-Peruvian guano is said to contain, in its natural state, from 30 to 35 per cent of anhydrous phosphoric acid, in combination with from

30 to 40 per cent lime, magnesia, potash, soda, and ammonia. This is nearly double the quantity of phosphoric acid found in bones and other substances, from which the superphosphates usually sold are prepared.

Phospho-Peruvian guano is a guano found in some of the West India islands, very rich in phosphoric acid, which is found in it in a state more available for the use of the plants than it is in bones and other phosphatic manures. When brought to this country, it is subjected to a chemical process with sulphuric acid, after which it is sold as Phospho-Peruvian guano. Professor Voelcker has a very high opinion of it: he says—"Phospho-Peruvian guano being much richer in phosphates, and not containing so much ammonia as to cause too luxuriant a development of leaves at the expense of the bulb, is much superior to Peruvian guano as a manure for turnips, swedes, mangels, and potatoes; and I have, indeed, no hesitation in expressing the opinion that, for root crops the manure which I analysed is by far the most valuable fertiliser, whether natural or artificial, which as yet has been offered to the public." It is said "to sustain, in just proportions, all the ingredients requisite for the rapid and healthy development of all our cultivated plants."

Sombrero Phosphate, an analysis of which was presented by Professor Anderson in his last report of "Proceedings in the Laboratory," promises to be a valuable addition to those substances which are now used for the preparation of phosphates. It has also lately engaged the attention of Dr Cameron in the Dublin Chemical Society, who makes the following remarks on it:—

It is said to exist in enormous quantities in the little island of Sombrero. It occurs as a soft, rather light, and easily pulverisable stone. A substance somewhat analogous to the Sombrero phosphate is met with on the Monk's Island (where the Phospho-Peruvian is obtained); but as it contains only phosphate of alumina, it is not, although existing in enormous quantities, imported for agricultural purposes, as it is generally believed that phosphoric acid, when in combination with alumina, is incapable of ministering to the wants of vegetable life. As, however, Mr Paul Sharard has recently shown that the phosphoric acid which exists in soils is invariably combined with sesquioxide bases (alumina or peroxide of iron), and never with protoxides (lime or magnesia), it is more than probable that the phosphate of alumina in the Sombrero and Monk's islands minerals might be really available to plants, without being even subjected to the vitriolising process. To say the least, it would be in the highest degree desirable to institute experiments with the view of testing the agricultur l value of these substances, when used *per se*.

Sombrero is an uninhabited island in the West Indies, the most northern of the Caribbean Islands, about three-fourths of a mile long, and about one hundred and fifty yards broad. It is flat, rugged, and without soil, excepting a small patch in the centre, which grow a little grass and some weeds. Multitudes of sea-[illegible] island during [illegible] breeding season

The Sowing of different Varieties of the same Grain, a Means of preventing the Crop from being Lodged.—High farming has produced many changes, both in the operations of the farm and in the varieties of plants cultivated. The great evil that the high farmer has to contend with is the over-luxuriance of his grain crops; hence many varieties of the cereals which were formerly great favourites with farmers are now almost discarded, or are at all events displaced by others, which, though by no means equal in quality, are more profitable to the farmer from possessing stiffer straw, and thus being less apt to be laid. In fact, so great has been the loss to farmers within the last few years from the over-luxuriance and consequent laying of their crops, that top-dressing with guano and other nitrogenous manures has been less practised. We lately saw the report of an experiment, the results of which clearly proved the advantage of mixing different kinds of wheat as a means of preventing, in some degree, the loss from the crop being laid. Six lots of ground were measured off; in four of them, long and short straw varieties of wheat were sown singly and unmixed, and on the other two lots mixtures of short and of long straws were sown. The treatment and quantity of seed of all the lots were the same. In summer, after the heads were filled, a very violent storm occurred, accompanied by very heavy rain and a little hail, which laid flat the crop on all the different lots. On those four where the varieties of wheat were sown singly, the crop never became erect again; while the crops from the mixtures gradually assumed their upright position. The reason given for this is, that the straw of different varieties of wheat being rarely of equal length, the heads stand at different levels, so that when a storm comes and batters down the crop, the tallest stalks protect the shortest; and these again act as a support to the former when they have been bent down by the storm, and thus prevent the straw from being broken—in which case the crop never resumes its former erect position. When, however, only one variety of wheat or grain is sown, the straws being all of equal length and the heads on the same level, they all yield at the same time to the fury of the blast; and from the great weight of the heads, now increased by the water on them, they descend more rapidly, and so completely as to injure the elasticity of the straw, and thus prevent the rising of the crop again.

Most farmers are agreed that a judicious mixture of different kinds of grain will yield a larger produce than if each kind were sown separately—thus, Hopetoun, and Early Angus, and Sandy, and Berlie oats, give a larger produce than if each were sown separately; so also, among wheats, Hunter's and Fenton not only produce a larger crop, but a sample that meets with a readier market. We may remark that the habit of growth of the Fenton wheat would lead us to suspect that it is not a distinct variety, but a

hybrid. The straws, though generally short, are all of unequal length, and there is no variety of wheat that stands up better than it: if we examine a sheaf of Fenton wheat, this inequality of the straw is most observable; for though it may have been most carefully cut and bound up, heads will be found in abundance all from the band up.

AGRICULTURAL SUMMARY FOR THE QUARTER.

THE weather in January and February has been open, stormy, and wet, with little or no frost, and but a slight fall of snow on the 7th of February, which was not general throughout the country. With such weather, it is not difficult to predicate the nature of the operations of the farm,—ploughing when the land is dry enough, and threshing when the weather was seasonable, and often from necessity when it was unseasonable. The mild open weather we have had since harvest has tended much to facilitate the labours of the farm; the only operation that is behind being that of carting manure, and the only land to be ploughed now is that from which turnips have not yet been removed. Owing to the extremely wet winter, the usual extent of land has not been dunged on the stubble, so that in this respect a considerable portion of the labour will be thrown forward to spring; but this will not be materially felt, owing to the forwardness of the labour otherwise.

The markets have been steadily low and dull throughout the season, without the slightest indication of a rise. At the beginning of the season, some hopes were entertained of a rise in price about this time, but now there is nothing but an uncertainty as to what the coming months will bring forth, though speculators seem inclined to believe in readier sales and higher prices. It is, however, remarkable that foreign cargoes of grain are carried at once on their arrival into the interior, instead of being stored up in the sea-port towns. The prices for butcher-meat and dairy-produce are, however, much more encouraging to the farmer; and there is no immediate prospect of a fall; on the contrary, there is every indication of a rise in the price, of mutton at least. We have so often alluded to the causes of this in previous reports that we will say nothing farther on the subject at present. Though the losses among dairy stock are very great, the price of the produce is so remunerative, that we have been informed by a not very extensive proprietor of cows in town, that he can afford to lose a cow every month.

There is still a large quantity of potatoes in the country which have not been showing [illegible] symptoms of decay in the pits during the la[illegible] [illegible] cannot be said of turnips which

were stored in the beginning of the season. A commendable prudence induced many farmers to lay in a winter store of this root to provide against the frost, against which the pits were carefully protected. The mild winter, however, has cause the roots so carefully pitted to sprout, and thus lose a great deal of their nourishing quality. We never recollect of seeing turnips so much sprouted at this season; and we regret to say that in some instances a good many of them are found to be rotten. We are inclined to think that, though the open winter has increased the bulk of the crop much more than was at one time expected, still the real amount of nourishment in the crop for animals in spring will be no greater, both on account of the great waste from sprouting and from decay of roots in the pits. The failure of the turnip crop in the neighbourhood of Edinburgh this year will tend to produce great changes in the management of some farms at a distance from town, and also in the means of supply of roots to the cow-feeders in Edinburgh. The latter have discovered that they can be supplied with sounder and cheaper turnips at the railway stations than in the fields in the immediate neighbourhood of the town. And these turnips have been carried from farms at different distances all along the line of railway, as far as 100 miles in some instances. Few farmers expect to realise more than 7s. per ton for their turnips, with the addition of the manure—say altogether 10s. per ton. We state what is considered a high rate for turnips obtained by consuming them with cattle and sheep on the farm. Now, if 16s. and 17s. per ton can be got for them in town, the farmer near a railway station, and at an ordinary distance from Edinburgh, has a pretty fair margin over to pay for the carriage of the turnips to town, and of the manure to his farm. Of course, in such cases the farmer must exercise his own judgment as to the disposal of his straw; but in many instances where there have been recent improvements in land, there is a larger breadth of green crop on the farm than is necessary for the making down of the straw; and this excess of green crop, it is well to know, will meet with a ready market in town.

The season for purchasing light manures is again at hand, and, as usual, farmers are annoyed and perplexed by the numerous circulars which are forced upon them by dealers extolling the virtues of their manures, giving undoubted analyses and courting public patronage, were it to the extent only of a single cwt. of their wares. We would advise our friends to relieve themselves of their perplexity by at once shortening their leet, confining their orders only to dealers of known respectability, and to manures of established reputation. We would by no means discourage the trying of a few experiments with new manures, but let these be on a small scale, and the results be accurately observed for the future guidance of the farmer himself. A farmer should never be guided solely by the report of any

neighbour as to the value of a manure, for the circumstances of the farm might be quite different from those of the farm on which the manure was tried, and, what is often the case, the manure delivered to him might not be equal in quality to that delivered to his neighbour. There is one thing well ascertained and brought out by experiments performed last year and published in different periodicals—viz. that many of the lower-priced manures will produce a larger and cheaper crop of turnips than Peruvian guano.

Societies.—During the last quarter the annual meetings of some of the principal agricultural societies have been held. Of these, that which has engrossed most the attention of the public is the General Meeting of the Highland and Agricultural Society of Scotland, held on the 19th January, and adjourned twice. This will be memorable as being the stormiest meeting of this useful and long-established society ever held. The fact of there being two adjournments, though the programme indicated no greater amount of business than usual to be brought forward, is a strong evidence of the great difference of opinion which was expressed on the subjects brought forward, and of the keenness and doggedness with which the opposing parties must have supported their opinions. The whole proceedings were in striking contrast with the usual decorum and unanimity with which the business of the Society is carried through at general meetings.

A considerable part of the business was entirely of a routine character, possessing no new feature; but there were other portions which elicited considerable discussion—we would almost say wrangling. On these *questiones vexatæ* it is not our intention to enter, with the exception of one, and that only as our attention has been directed to it by a perusal of the last number of the Journal of the Royal Agricultural Society of England. We refer to the management of the General Shows, our opinion on which will not be indicated at present, as the Report of the Committee on this subject will shortly be published. But we will simply call attention to this one fact, that, while upwards of a hundred pages of the Journal of the Royal Agricultural Society of England are taken up with the reports of the stewards and judges at the Show in Chester, containing much valuable information, the report of the Show at Aberdeen is comprised in two pages of the Transactions of the Highland Society, a great part of which is taken up with an explanation of the change of the day of the Show. It might be said that the interest of the reports in the English Journal is much lessened by their appearance so long after the Show; but we are told that they would have been published in the previous number in August, but unfortunately one very important report was not received till after the Journal was in circulation." We would suggest the advantage of postponing the publication of the Journal in future for a week or two, so as to give a little more time for the making out of

the reports, and the certainty of their appearing in the August number of the Journal. Of course, in speaking of the reports of the two societies, we do not mean the list of the awards of the premiums, which is generally published immediately after the Show.

The Royal Agricultural Improvement Society of Ireland held one of its monthly meetings in January last, at which the principal subject under consideration was a proposal to apply for a charter of incorporation, a lengthened discussion on which arose from the Royal Dublin Society having requested to be favoured with a draft of the proposed charter. We trust that no jealousy will be allowed to spring up between those two useful societies, which have hitherto worked harmoniously, so as to impair the benefits to the country of their valuable services. A subject introduced at this meeting also engaged the attention of the members of the Highland Society at one of the adjourned meetings—viz. that of increased and improved accommodation for the labouring classes. Sir Robert Bateson, who brought forward the subject by letter, stated that "the absolute necessity exists of every labourer having a cottage wherein the sexes may have separate accommodation; the walls plastered and whitewashed, and the windows glazed and opening; the floor level and hard; the roof and doors sufficient to exclude the winds and rain; the children in that case would be early instructed to keep the windows and other parts of the cottage in such a state as to qualify them in part for the services they might afterwards engage in." To this I would add the possession of a garden, however small. Though the cottages in Scotland are not generally in such a state as to require the alterations pointed at in the letter of the honourable baronet, to insure comfort to their tenants, still both proprietors and tenants in some districts of Scotland would be discharging a duty incumbent on them, as well as consulting their own interests, were they to devote some more attention to the improvement of their labourers' cottages.

The North-East Agricultural Association, Ireland, at its annual meeting, unanimously adopted the report of its committee on weights and measures, which recommended, among other things, that the resolution of the Liverpool Corn Exchange, advising the selling of grain by the cental of 100 lb., should be agreed to. Since we last wrote on this subject, many other places, such as Hull, Glasgow, &c., agreed to use the cental henceforth; and the merchants in New York have also given in their adherence to it. We cannot, however, but express our regret that the members of the Corn Exchange, in these different places, should have so hastily resolved to do what is manifestly illegal. They should bear in mind that all sales effected by the new weights are null and void; and besides, the country was scarcely prepared for such a sweeping change, the disapproval of which has been unequivocally expressed already in more than one place. We believe that at present the selling by

the cental will not succeed, but we have little doubt but that in a few years the system will be generally adopted.

Farmers' clubs have taken advantage of the long winter evenings to exchange thoughts on agricultural subjects. At the Oxford Farmers' Club a most important question was discussed—viz. what kind of corn and cake are the most economical, at their present prices, for feeding sheep on roots? One party advocated the use of wheat, at present prices, as the most economical of grains, and oilcake the most economical of cakes; while the majority approved of an amendment that was made—viz. "That a mixture of beans, barley, and cake is preferable as food for sheep." We were particularly struck, in reading the report of the proceedings, with the arguments used by the different speakers; they were entirely of a scientific character, without reference to a single experiment. The arguments were based on the chemical composition of the substances employed, more than on the practical results produced by the comparative use of the different articles. We do not think that this is safe ground to proceed on, for many articles of consumption, such as wheat, may contain the elements which give it a nutritive value; and yet it may be found in practice not to have the same effect in the feeding of cattle and sheep as other substances of much lower nutritive value, either from the nourishing element (nitrogenous matter) not being in the most available form for the animal, or from the want of other elements absolutely necessary for its feeding. The publication of the discussion will be attended with good results, were it nothing else than drawing public attention to the fact that home-grown serials might be used with profit in the feeding of animals, either in combination with cake, or if judiciously mixed with chaff or cut straw, without any cake. The low price of grain and high price of butcher-meat are sufficient to induce farmers to institute comparative experiments in this interesting subject. We lately saw a highly valuable cake made by some farmers at a comparatively low price, by employing the damaged grain on their farms, and purchased, mixed with linseed, and subjected to the pressure of the ordinary hydraulic press; the cattle and sheep had a great relish for the cake, and throve very fast on it.

The Hexham Farmers' Club has lately had two subjects brought forward interesting to agriculturists—viz. "Autumn Cleaning" and the "History and Prospects of Agriculture." There was nothing new elicited in the discussion on the first subject, all the speakers having insisted on the importance of the operation. Mr ...y, of ...ton, who read the paper on the latter subject, made a ...ement which is worthy of being recorded here, and which is at ...iance with the opinion of those who advocate the profit of small ...ding. He said ... we contemplate the increase of the population ... 360,000 ...-year, we shall see that, unless

from wars and emigration, all the efforts we can use will fall far short of supplying them with food. It is on this ground that I think that you must have farms of considerable extent if you intend that the progress of agriculture should go on." After giving several reasons for farms of considerable extent being better adapted for the progress of agriculture, he proceeds: "I have had through my hands a good many farms of different descriptions; and for the last three years, when I have had a small farm of £100 a-year or less to let, I have been obliged to take the same rent, or perhaps less, than before; but when I have had a large farm of £500 a-year, I have been able to realise a great advance of rent; and if I have a farm of £1000 or £1200 a-year, I have had 25 or 30 per cent advance. I do not say I rejoice in this, but it forces itself on my observation." We are by no means inclined to differ with Mr Grey in this opinion, but we will make one remark, which is, that in many instances the farms in Scotland are too large for the capital of the tenants; and though we would not advocate a reduction in the size of the farms, we would wish to see an increase in the capital. An opinion on this subject coming from a man with the great experience, caution, and judgment of Mr Grey, must carry great weight, and have considerable influence with proprietors, who should be on their guard, in increasing the size of their farms, to select tenants with sufficient capital as well as experience and skill.

The Botley and South Hants Farmers' Club, at a late meeting, came to the following resolution on the cross-breeding of sheep:—"That this meeting is of opinion that careful and judicious crossing of sheep offers to both the breeders and graziers the best prospect of profit, and, at the same time, the best supply of mutton to our consuming population, and an increased supply of wool to the manufacturing community." While we agree with the terms of this resolution in the main—and we regret to say that the experience of too many breeders of the improved pure breeds will confirm our opinion, we must remark that the advantage and profit of cross-breeding is dependent very much on the purity of breed of the parents, so that the encouragement of the improving of the pure breeds should always be one of the principal objects of our agricultural societies.

Arterial drainage has been spiritedly taken up as a subject for discussion in the London Farmers' Club. It was introduced by Mr Clark, who enumerated the four great mischiefs arising from the defective state of our rivers and water-courses, namely, "actual damages by deluge, the prevention of agricultural improvement in the immediate vicinity of the streams, the injuries sustained by the lands situated above the reach of floods, but suffering from obstructions to their drainage, and the calamitous influence of the reeking and pestilential valleys upon the lives of a great proportion of our

left this country to prosecute their calling in Ireland
nant, formerly of Shields, in Ayrshire. He erected
for the accommodation of cattle during his occupan
of Sandyford, in the same county. On leaving the
lord insisted on Mr Tennant leaving these sheds in g
repair, to which he objected. It was ultimately agr
mit the matter to Mr James Morton, writer, as sol
gave the following judgment: "The referee, havi
the written reference, and heard parties', procura
accordance with the decision of the Supreme Court
Rossie *against* John Thomson, 8th February 1822,
nant, the late tenant of Sandyford, is not bound t
tenantable repair the cattle-sheds voluntarily ere
said farm at his own expense."

AVERAGE PRICE OF THE DIFFERENT KINDS OF GRAIN,

PER IMPERIAL QUARTER, SOLD AT THE FOLLOWING PLACES.

LONDON.

Date.	Wheat.	Barley.	Oats.	Rye.	Pease.	Beans.
1858.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Dec. 4.	44 3	36 10	25 4	32 6	42 3	40 5
11.	43 8	37 9	25 1	31 4	46 7	38 9
18.	43 2	35 6	24 0	31 10	50 0	34 10
25.	44 5	36 3	23 8	32 6	50 11	37 8
1859.						
Jan. 1.	42 8	34 0	23 11	33 6	58 4	35 6
8.	43 2	33 8	24 9	32 6	52 7	36 4
15.	44 10	34 1	24 8	30 8	44 4	36 3
22.	45 0	35 10	24 9	28 6	46 3	38 8
29.	44 5	34 0	23 9	30 4	42 3	36 10

LIVERPOOL.

Date.	Wheat.	Barley.	Oats.	Rye.	Pease.	Beans.
1858.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Dec. 4.	40 11	33 0	22 11	30 4	40 6	42 3
11.	39 4	33 6	21 3	30 2	42 8	43 6
18.	40 10	34 10	22 1	28 6	44 6	40 0
25.	40 5	33 5	21 4	27 6	45 4	44 2
1859.						
Jan. 1.	42 0	32 2	20 9	27 9	44 6	43 10
8	40 0	32 6	22 5	26 8	43 8	37 8
15	40 2	33 6	20 11	25 4	42 6	41 3
22	42 0	32 0	23 0	24 6	41 4	43 9
29	40 8	32 4	19 9	26 6	40 6	42 4

EDINBURGH.

Date.	Wheat.	Barley.	Oats.	Pease.	Beans.
1858.	s. d.	s. d.	s. d.	s. d.	s. d
Dec. 1.	42 0	31 2	22 3	40 6	41 1
8.	41 1	30 5	21 9	38 10	40 0
15.	41 4	31 2	21 9	38 6	39 2
22.	40 7	29 9	22 1	39 0	40 1
29.	40 6	29 0	22 5	39 4	40 0
1859.					
Jan. 5.	41 4	30 8	22 7	38 10	39 4
12.	42 4	30 9	23 8	39 0	40 8
19.	42 8	32 3	24 2	40 6	41 8
26.	41 7	32 4	24 1	41 1	41 9

DUBLIN.

Date.	Wheat, p. barl. 20 st.	Barley p. barl. 16 st.	Bere, p. barl. 17 st.	Oats, p. barl. 14 st.	Flour, p. barl. 9 st.
1858.	s. d.	s. d.	s. d.	s. d.	s. d.
Dec. 3.	22 6	14 8	11 4	12 6	16 6
10.	22 8	14 10	10 9	12 8	16 8
17.	22 3	13 6	10 6	12 2	16 5
24.	22 6	13 8	11 6	12 4	16 8
31.	22 8	14 0	13 0	12 0	16 9
1859.					
Jan. 7.	23 3	15 2	13 4	12 6	16 10
14.	23 6	15 11	13 8	12 9	17 0
21.	23 0	15 5	13 2	12 6	16 10
28.	23 6	15 6	12 6	12 1	16 9

TABLE SHOWING THE WEEKLY AVERAGE PRICE OF GRAIN,

Made up in terms of 7th and 8th Geo. IV., c. 58, and 9th and 10th Vict., c. 22. On and after 1st February 1849, the Duty payable on FOREIGN CORN imported is 1s. per quarter, and on Flour or Meal 4½d. for every cwt.

Date.	Wheat. Weekly Average.	Wheat. Aggregate Average.	Barley. Weekly Average.	Barley. Aggregate Average.	Oats. Weekly Average.	Oats. Aggregate Average.	Rye. Weekly Average.	Rye. Aggregate Average.	Pease. Weekly Average.	Pease. Aggregate Average.	Beans. Weekly Average.	Beans. Aggregate Average.
1858.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Dec. 4.	41 5	41 10	35 4	35 4	22 8	23 0	31 2	31 8	43 10	44 11	42 6	42 9
11.	41 0	41 7	35 1	35 3	22 10	22 11	32 6	31 11	43 8	44 7	41 8	42 7
18.	40 2	41 1	33 11	35 0	21 10	22 8	32 5	31 10	46 5	44 11	41 1	42 4
25.	40 0	40 10	32 10	34 7	21 9	22 5	31 2	31 10	13 4	44 11	41 2	41 11
1859												
Jan. 1.	39 10	40 7	32 4	34 2	21 10	22 3	33 5	32 2	42 11	44 5	40 0	41 6
8.	40 6	40 6	32 2	33 7	21 5	22 1	30 5	31 10	41 3	43 7	39 9	41 0
15.	41 3	40 5	32 7	33 2	21 4	21 10	27 6	31 3	41 8	43 3	39 2	40 6
22.	41 9	40 7	33 2	32 10	21 8	21 8	30 10	30 11	42 6	43 0	39 4	40 1
29.	41 7	40 10	32 5	32 9	21 10	21 8	32 6	31 0	41 11	42 3	40 8	40 0

FOREIGN MARKETS.—Per Imperial Quarter, free on board.

Date.	Markets.	Wheat.	Barley.	Oats.	Rye.	Pease.	Be…
1858.		s. d. s. d.	s. d. s. d.	s. d. s d.	s. d. s. d.	s. d. s. d.	s. d.
Dec. ..	Danzig	35 0 - 43 6	20 6 - 28 6	16 0 - 21 6	23 6 - 27 0	32 6 - 42 0	28 6-
1859. Jan. ..	Danzig	33 6 - 42 0	21 6 - 28 0	16 6 - 22 0	24 6 - 28 0	34 6 - 44 6	30 6-
1858. Dec. ..	Hamburg	34 6 - 42 9	20 0 - 24 6	16 6 - 23 0	22 6 - 26 6	38 6 - 46 3	30 0-
1859. Jan. ..	Hamburg	32 6 - 41 3	21 6 - 25 6	15 6 - 20 3	21 6 - 25 6	36 6 - 45 6	32 0-
1858. Dec. ..	Bremen	30 6 - 40 6	20 0 - 25 6	16 6 - 21 6	20 6 - 28 6	32 6 - 41 6	30 6-
1859. Jan. ..	Bremen	30 0 - 40 0	20 0 - 24 0	15 6 - 20 0	20 0 - 27 6	33 6 - 43 0	32 0-
1858. Dec. ..	Königsberg	34 6 - 42 6	20 6 - 25 6	16 0 - 23 0	22 6 - 28 6	32 6 - 42 0	31 6-
1859. Jan, ..	Königsberg	32 6 - 41 6	20 0 - 24 0	15 6 - 21 6	20 6 - 26 6	35 6 - 45 0	32 6-

Freights from the Baltic, from 3s. 6d. to 5s.; from the Mediterranean, 8s. to 10s.; and by steamer from Hamburg, 3s. to 4s. per imperial qr.

THE REVENUE.—From 31st December 1857 to 31st December 1858.

	Quarters ending Dec. 31. 1857.	Quarters ending Dec. 31. 1858.	Increase.	Decrease.	Years ending Dec. 31. 1857.	Years ending Dec. 31. 1858.	Increase.	D…
	£	£	£	£	£	£	£	
Customs	5,590,018	6,209,187	619,169	..	22,464,252	24,092,000	1,627,648	
Excise	4,769,000	5,004,000	235,000	..	17,472,000	17,966,000	494,000	
Stamps	1,761,000	2,029,000	268,000	..	7,269,223	7,996,343	727,120	
Taxes	1,361,000	1,383,000	22,000	..	3,104,020	3,158,033	54,016	
Post-Office ..	810,000	860,000	50,000	..	2,992,000	3,075,000	83,000	
Miscellaneous	807,707	1,000,471	192,764	..	1,950,750	2,458,431	462,081	
Property-Tax	808,437	547,000	..	261,437	15,137,997	7,591,188	..	7,
Total Income	15,907,162	17,032,658	1,386,933	261,437	70,390,342	66,336,995	3,428,467	7,
	Deduct decrease....		261,437		Deduct increase....			3,
	Increase on the qr...		1,125,496		Decrease on the year			4,

PRICES OF BUTCHER-MEAT.—Per Stone of 14 Pounds.

Date.	London. Beef.	London. Mutton.	Liverpool. Beef.	Liverpool. Mutton.	Newcastle. Beef.	Newcastle. Mutton.	Edinburgh. Beef.	Edinburgh. Mutton.	Glasg… Beef.
1858.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.
Dec. ..	6 6 - 8 6	6 9 - 8 9	6 6 - 8 3	6 6 - 8 6	6 6 - 8 3	6 9 - 8 6	6 6 - 8 6	6 9 - 8 9	6 9 - 8 6
1859. Jan. ..	6 6 - 8 6	6 9 - 8 6	6 9 - 8 9	8 2 - 9 6	6 9 - 8 6	7 0 - 8 9	6 9 - 8 6	7 0 - 9 3	6 9 - 8 9

PRICES OF ENGLISH AND SCOTCH WOOLS.—Per Stone of 14 Po…

English.	s. d.		s. d.	Scotch.	s. d.
Merino, ...	20 0	to	26 6	Leicester Hogg, ...	20 0
.. in grease, ...	18 0	,,	20 6	.. Ewe and Hogg, ...	19 0
South-Down, ...	20 6	,,	26 6	Cheviot, white, ...	16 6
Half-Bred, ...	18 6	,,	22 0	.. laid, washed, ...	10 6
Leicester Hogg, ...	20 6	,,	27 6	.. .. unwashed, ...	8 0
.. Ewe and Hogg, ...	18 6	,,	24 6	Moor, white, ...	9 0
Locks, ...	10 6	,,	13 0	.. laid, washed, ...	7 6
Moor, ...	7 0	,,	11 0	.. .. unwashed, ...	6 6

INDEX.

PRINTED BY WILLIAM BLACKWOOD AND SONS, EDINBU